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A

MONOGRAPH

OF THE

FRESHWATER UNIVALVE MOLLUSCA

OF THE

UNITED STATES,

INCLUDING NOTICES OF SPECIES IN OTHER PARTS OF NORTH AMERICA.

BY S. S. HALDEMAN,

Professor of Zoology in the Franklin Institute, and Vice-President of the Entomological Society of Pennsylvania; Member of the Academy of Natural Sciences of Philadelphia; of the Boston Society of Natural History; of the Association of American Geologists and Naturalists; and of the Société Cuvierienne of Paris, etc.

PHYSADÆ.

PHILADELPHIA:

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1842.

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M. Prod. Mexico

Tant que l'on n'a étudié et recueilli que les seules Coquilles, les Testácés terrestres et fluviatiles ont été négligés, parce qu'ils offrent moins de variétés dans les formes et moins d'éclat dans les couleurs de leurs enveloppes pierreuses, que ceux qui habitent les eaux de la mer. Mais lorsque voulant prendre de ces êtres singuliers une connaissance un peu plus approfondie et plus philosophique, on s'est mis à examiner les animaux eux-mêmes, les espèces de terre et d'eau douce sont redevenues un objet principal d'attention, parce qu'il est plus facile de se les procurer avec leur animal vivant.

Cuv. rapport essai conch.

It will enlarge their views beyond the feverish expectancy of a precocious and questionable celebrity, so easily and unworthily attainable, by the establishment of insulated remarkable genera; for it is only by taking up groups, and thoroughly discussing them, that the progress of the science can be at all promoted.

W. E. Shuckard, Cab. Cyc. Insects, p. 162.

The genus Limneus is at present ill understood; many of the species being ill defined, and no two authors, except mere copyists, agreeing which are veritable species and which varieties; in fine, it may be truly designated "rudis indigestaque moles." To disentangle the species, and rectify the errors of authors, would, I fear, in the present state of our knowledge, require greater talents and perseverance than fall to the lot of the generality of mankind. Neither the influence of external circumstances, nor the great differences observable in the various periods of growth, appear to have been hitherto sufficiently investigated; and a correct monograph of this genus would not only require the lyncean eye of a Jenyns, but the searching skill of a host of less accomplished auxiliaries.

Kenyon, Mag. Nat. Hist., vol. vii. p. 379, anno 1834.

A2193

TO THOSE WHO LABOR

FOR THE

ADVANCEMENT OF THE DIFFERENT BRANCHES

OF

NORTH AMERICAN ZOOLOGY,

THIS CONTRIBUTION TO THE SCIENCE

IN WHICH WE ARE ALL MUTUALLY INTERESTED,

IS RESPECTFULLY INSCRIBED,

BY THEIR FELLOW LABORER,

THE AUTHOR.

PHYSADÆ.

Gasteropodous monoicous inoperculate pneumobranchiate testaceous aquatic mollusca; having a single pair of triangular or filiform contractile tentacles, the surface of which is covered with vibrillæ,* and having the eyes at their internal base: the shells are thin in texture, of uniform tints, and with the margin of the aperture sharp.

The family Limneana of Lamarck, belongs to Cuvier's Pulmonifera aquatica, of his order Pulmonifera, and class Gasteropoda; to Blainville's family Limnacea, of his order Pulmonobranchiata, and sub-class Paracephalophora

* Cilia of authors, which term, however, was preapplied, and is still used, for hairs or bristles of a certain character. Thus the mouth of an animalcule, and the legs of an acarus, are both said to be *ciliated*. My friend Professor Bailey, an acute microscopist, approves of the term I have proposed for these vibratile organs.

monoica; and to Férussac's order Pulmonalia inoperculata, and sub-order Hygrophilidæ. They live in the water, but most of the genera are obliged to come to the surface occasionally as they breathe air. From the lightness of their shells, they possess in an eminent degree the power to move along in an inverted position, with the foot applied to the surface of the water, thus affording the observer an opportunity to examine the oral organs when put into operation by the animal. The foot is adapted for a more rapid locomotion than most of the preceding families possess. This is particularly obvious in Physa, which is the most active, and, as I believe, the most highly organized genus in the family. The members of this family are generally confined to stagnant waters, or those parts of small streams which are not liable to be continually rippled, as this would render the opening of the branchial cavity at the surface a matter of some difficulty.

The foot appears to be covered with a secretion which has a repulsion towards water, as that organ will form a concavity at the surface, into which the water will not readily flow; but when this cavity is so far withdrawn that it

becomes filled, the animal generally descends.* I have occasionally observed some individuals to become detached from the bottom, and rise suddenly to the surface;† but this generally happens when they have crept down along some object, with a very full supply of air. Some of the species have the power to ascend and descend, by expanding and compressing the volume of air contained in the branchial cavity, a method more simple than the one which Doctor Buckland has demonstrated to exist in the Nautiloid family. I have thus observed Physa heterostropha slowly to rise through the water, open its foramen, and descend again with an equally slow motion.‡ Without a power of this kind, these animals would not be able to attain the surface, in situations where they might accidentally be deprived of aquatic plants, or other extraneous bodies, to which they

* On some occasions, however, it becomes necessary, in addition to the withdrawal of the foot, to allow a few bubbles of air to escape, before a sufficient specific gravity is attained to allow the animal to sink.

† Loudon's Mag. Nat. Hist., 1830, vol. iii. p. 532.

‡ It has the power also of ascending and descending in water a few inches deep, by the aid of a glutinous thread.

might attach themselves. That the density of the internal and external air is sometimes different in this family, and in the terrestrial Pneumobranchiata, is proved by the slight clicking sound that frequently accompanies the opening of the branchial foramen.

The head varies somewhat in shape, but is never decidedly proboscidiform as in the more highly organized Melaniadæ. I have never been able to discover that the Limneans or Helices possess true organs of vision; but it is probable that they can distinguish light from darkness. In the other freshwater families described in this work, the power of vision, or sensitiveness to the action of light, is rendered evident by intercepting it with an opaque object, when they instantly retract; and I have even observed the protruded branchial canal of Unio radiatus (Gmelin) to be suddenly withdrawn, when subjected to the same experiment.

I have ventured to name this family from what I conceive to be the principal genus, after repeated examinations of them. It is, however, so difficult to determine the question of superiority of structure, in animals whose organization rests upon the same model, that the result

must, in general, be considered as assumed, rather than as demonstrated. As linear tentacles appear to constitute the normal form among the mollusca, their triangular form in Limnea, would seem to point out this genus as presenting the most important distinctive character; but on similar grounds we might place the Helicinæ above this family, on account of the situation of their eyes, and the possession of an additional pair of tentacles; whereas, they are much less highly organized than the Limneans;* and we might place Ancylus at the beginning of the latter family, because it is the uniting link between the hydrobranchiata and pneumobranchiata.

Malacologists are universally agreed, that with the genera Physa, Limnea, and Planorbis,

* In a cancelled portion of my manuscript, written under the impression that Limnea should stand at the head of the family, I remarked that "I at one time considered the genus Physa to stand higher than Limnea, judging from their habits, and considering the mantle as indicating a more complex organization; but these views were counterbalanced by the belief that sinistral animals do not occupy a more elevated station than their congeners, because, from the rarity of reversed genera, they may be viewed somewhat in the light of monstrosities."

this constitutes a natural family, the only difference of opinion arising upon the order in which they should be placed. Mr. Swainson places Planorbis at the head, because the shell represents that of Nautilus; a consideration which would have prevented me from giving it this position; because *an animal cannot represent a different one, however high, and be the typical representative of its own family.** The principal difference of opinion, however, has been upon the question whether Ancylus does or does not belong to the family. In one work, it is considered a Patella; in another, a Crepidula; whilst one party asserts that it breathes air, another, that water is its only respiratory medium. Amidst this contrariety of opinion, the principal modern authors have placed the genus in the family now under consideration, but more, I suspect, on account of the great similarity of the soft parts, than from any certainty as to

* Mr. Swainson places Corvus at the head of the insessorial birds; and if the carnivorous genus nearest allied to it, is to be considered typical, Buteo will stand above Falco, among the falconine birds! The genus Perca stands as the representative of its class, although there are many genera which are more nearly allied to the reptilia.

what medium they breathe. This resemblance is so apparent, that it would be likely to induce one to believe the genus strictly pneumobranchiate, without evidence of a contrary nature; and the impossibility of determining its position as a hydrobranchiate mollusc, must have had its influence in retaining it among the Limneans.

For my own part, whilst I had no right to contradict the respectable authority in favor of free air being the medium of respiration, my own observations convinced me that our Ancyli, at least, breathe water. I found them attached to the lower side of stones, in rapid water, within dead bivalve shells, and in such situations generally, which they could never have attained from the surface. Moreover, I never saw them at the surface of the water, even in vessels under my own eye. I now suspected that, occupying so debatable a ground, the branchiæ of this genus might be adapted indifferently to aquatic or aërial respiration, and I was confirmed in this view, by the discovery of a hydrobranchiate Physa (see Physa globosa) in Tennessee.*

* I would recommend to naturalists to travel in their

It results from these facts, that Cuvier and Férussac were wrong in naming this family *Pulmonifera* and *Pulmonalia;* and I believe we are indebted to Lamarck, for having been the first to indicate the respiratory organs as true branchiæ in structure, but adapted to aërial respiration.*

The North American Limneans may be said to range from the thirty-fifth to the fiftieth degree of north latitude; but some are found farther south, Limnea attenuata inhabiting near the city of Mexico; and a species of Physa, and one of Planorbis, near Vera Cruz. A larger number of species inhabits New England than any other part of North America of equal extent; whilst not a single species of the Melanians,

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own, rather than in a public conveyance, as affording better facilities for observation. In the summer of 1841, accompanied by an assistant, and having about one hundred and fifty pounds additional weight, I drove a single horse, still in my possession, the distance of 1800 miles in forty-five consecutive days, and often over mountainous regions, and the most execrable roads, frequently breaking shafts, springs, and other portions of the vehicle, and examining every stream upon the route.

* Blainville and Deshayes appear to hold the same opinion.

and but one Paludina, has been yet observed there. They prefer quiet cold waters, species of Physa being sometimes found in springs having a temperature nearly as low as ten degrees centigrade, and they may be sometimes seen moving along the bottom, when the surface is covered with ice. This fact tends to prove that they can remain a long time beneath the surface without requiring a fresh supply of air; and it is not improbable that they can remain deprived of access to the atmosphere, for several days, weeks, or even months, when the full action of their system is retarded by cold. I have observed them moving about in water at the temperature of three or four degrees centigrade, when species of Melania and Paludina were torpid; the latter, in fact, are just able to move, in the most languid manner, in a temperature of eight or nine degrees.

Like the Helicinæ, this family is hermaphrodite, both sexes being united in the same individual. All the genera are oviparous, the eggs being generally deposited upon the under surface of stones, or upon sticks and leaves in the water, many being enclosed in a voluminous transparent glairy mass. This mass, in Pla-

norbis, is not so large as in Physa and Limnea, and has a firmer texture. I have known the ova to become matured in two or three weeks, but the time must vary with the species and temperature.

The different sub-generic sections in this family, are, probably, nearly as indicated in the following table.

PHYSA. Shell reversed, mantle lobed, pl. 1.
PHYSELLA, *H.* With branchiæ, shell globose, pl. 5.
APLEXA, *Fleming.* Lengthened, mantle simple, pl. 5.
PHYSODON, *H.* Columella toothed, pl. 5.
DIASTROPHA. Shell umbilicated, no fold.

LIMNEA. Shell lengthened, pl. 5.
BULIMNEA, *H.* Shell thick in texture, inflated, pl. 3.
ACELLA, *H.* Shell slender, whirls very oblique.
RADIX, *Montf.* Shell short, greatly expanded, pl. 11.
AMPHIPEPLEA, *Nilss.* Mantle lobed. Vide LIM., p. 3.
? LEPTOLIMNEA, *Sw.* Nearly cylindrical, spire thick.

PLANORBIS. Whirls few and regular, pl. 1.
PLANORBINA, *H.* Whorls numerous, nearly equal.
PLANORBELLA, *H.* Aperture campanulate, pl. 1.
PLANORBULA, *H.* Aperture armed with teeth.
SEGMENTINA, *Fleming.* Cavity with open partitions.

ANCYLUS. Apex of the shell upon the right.*
VELLETIA, *Gray.* Apex of the shell upon the left.*

* Some authors may think it necessary to subdivide each

? POTAMOPHILA, *Sw.* "Shell resembling a Limnea, but with a distinct fold on the pillar." Mr. Swainson gives this name to certain species which he removes from Conovulus to place among the Limneans.

Lamarck has a hypothesis touching the origin of this family,* which has induced some individuals to attack his character, by which unphilosophic means his views were to be subverted. These authors may have supposed such ideas to be unworthy of a serious refutation, apparently ignorant of the fact, that *any* views from so eminent a source, are worthy of the profoundest consideration of less gifted authors, who assume, rather than form their opinions.† Every true naturalist must thank Mr. Lyell, the distinguished British geologist, for the manner in which he has discussed this question, his essay being that of a gentleman, confined to the point at issue, unencumbered with considerations which have no connection with it, and pre-

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of these sections, into those which breathe free air, and those which oxygenate the system from water. I am of the opinion that the same species can adopt either method, according to the circumstances in which it may be placed.

* Animaux sans vertèbres, vol. viii. p. 378.

† "If it is an obligation on science to proclaim the intervention of a divine power in the development of the whole of nature, and if it is to that power alone that we must ascribe all things, it is not the less incumbent on science to ascertain what is the influence which physical forces, left to themselves, exercise in all natural phenomena, and what is the part of direct action which we must attribute to the Supreme Being, in the revolutions to which

senting a marked contrast to the vulgar, bilious effusions of such characters as a correspondent of the Entomological Magazine, who regrets that he is obliged even to cite Lamarck's works!*

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nature has been subjected. . . . It is now time for naturalists to occupy themselves likewise, in their domain, in inquiring within what limits we can recognise the traces of a divine interposition, and within what limits the phenomena take place in consequence of a state of things immutably established from the beginning of creation.

"Let it not be said that it is not given to man to sound these depths: the knowledge he has acquired of so many hidden mysteries in past ages, promises more and more extended revelations. It is an error to which the mind, from a natural inclination to indolence, allows itself too easily to incline, to believe impossible what would take some trouble to investigate. We generally rather prefer imposing limits to our faculties, than increasing their range by their exercise; and the history of the sciences is present to tell us, that there are few of the great truths now recognised, which have not been treated as chimerical and blasphemous, before they were demonstrated."—*Agassiz, in Jameson's Journal*, 1842.

* This author's intellect appears to be sufficiently cobwebbed to enable him to apply *vernacular names* to shells and insects with great success; *one* of the methods long since invented to rob Linnæus of the right of citation for his species. By this means he will be enabled to spare the little liberality he possesses, from the great overstrain to which he is at present compelled to submit it. The use of

Mr. Charlesworth remarks, in the first volume of his Magazine of Natural History, that "Theory is often the great incentive to observation, the main stimulus to exertion, and the more widely those who are engaged in the prosecution of the same object differ amongst themselves as to the nature of their present conclusions, the greater, perhaps, would be the reliance which we should feel disposed to place in any points of common agreement that may hereafter be attained." This being admitted, I would like to see the Lamarckian hypothesis revived by some one capable of doing it justice. I furnish in these pages an additional intercalation, and consider that the Paludina subcarinata might be viewed in this connection. In this species we find a true Paludina, occasionally rounding its aperture, throwing it off from the body whirl, and not only assuming the physiognomy of Cyclostoma elegans, but actually departing so far from the normal character of its genus, as to construct a cyclostomoid opercle; that of the young animal enlarging spirally. This, however, does not continue; the animal, as a Paludina, is not endowed with the elements necessary to produce the entire opercle of a Cyclostoma, so that after continuing it to a certain point, the layers become normal, or concentric, apparently indicating the impossibility of a departure from its generic type, beyond a certain limit. But instead of taking this view of the shell in question, I regard it as one of the

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vulgar names has been carried so far, that some English authors use the word *pig!* instead of *hog* or *swine;* Professor Bell, however, has sufficient independence and respect for the language, to avoid this suiscidal course.

strongest proofs in favor of Mr. Swainson's theory of representation.

There are still those who suppose scientific research, and religion, to be incompatible with each other; and who will not receive a fact in the first department, until it be admitted upon competent authority in the other. Thus the theory of the solar system proposed by Laplace, was not well received until it was examined and put forth anew by Herschell.* The next great question will be (now that that of the interchange of species may be considered as settled in the negative) to account for the succession of animal forms, which the lithographic pages of geology display to our view: that is, has there been an actual modern creation, in the usual sense of the term, of all the unfossilized recent forms; or have they been called forth by laws established by Almighty power at the creation? The latter opinion will be likely to prevail, if the alleged production of a species of Acarus by galvanism, be proved to have been accomplished; nor can I see anything more impossible in the modern production of the Sarcoptes scabiei, for example, than in the recent development of a crystal.†

Should this question be fairly brought before the public, some of the most bitter opponents of Lamarck, will probably adopt his views in full; as some of them have done

* It is difficult to conceive why the early objections to this one, should not have been turned against the theory of gravitation.

† The Reverend Wm. Kirby is of the opinion that the pediculi were brought into existence subsequent to the creation of man.

to a great extent, in contending that external agents have produced the different characters presented by the order Bimana.

The experiment of Cross will be an *experimentum crucis* for the question of the mutability of species, should it be ascertained that the resulting Acarus be not produced from the egg of a known species; for it will doubtless be proven that it is not developed from an animalcule, a zoophyte, or a planarian worm.

The great family of the Helicidæ requires a careful study; because, from the diversity of form which it presents, it appears to offer better means than any other, towards the solution of several great physiological questions. The principle of the revolution of the spiral, in Planorbis, which results in an apex upon the same side with the obliquity of the aperture, in some species, and upon the opposite one in others, is to be discovered; and the causes of the peculiarities presented by the Helices, must be accounted for; such as the reversal of the aperture in Anostoma and Strophostoma, the possession or the want of teeth, and the laws which govern their production. We are at present quite ignorant of the extent to which these characters may be considered generic; and whilst one author separates Monoceros from Purpura, another unites them, because he cannot detect the peculiarity in the organization of the soft parts, which would enable him to account for the formation of the teeth, although the presence of the latter demonstrates the existence of the former.

Chicquésalunga, October, 1842.

Genus PHYSA, *Draparnaud.*

Plate 1.—Figs. 1—3.

Testa convoluta, ovata vel oblonga, sinistrorsa: spira exserta: apertura longitudinalis, labrum acutum, labium in anfractum ultimum expansum.

SYNONYMS AND REFERENCES.

Bulinus, Adanson. Hist. Nat. de Senegal, pl. 1, fig. G2.
Bulla, Lin. Gmel. Dillwyn. *Planorbis*, Müller.
Bulimus, Bruguière, Poiret.
Physa, Draparnaud. Hist. Nat. des Moll. ter. et fluv.
" Lamarck. An. sans vert., vol. viii. p. 398.
Limnea, Sowerby. Genera of Shells.
" Sowerby, Jr. A Conchological Manual.

DESCRIPTION.

Animal spiral, subglobular or lengthened: head short, flat, rounded, and emarginate in front; mouth provided with lateral lips, and a spoon-shaped tongue: foot rounded, and not much extended in front, but long and pointed posteriorly: tentacles long and slender, and swelling into an auricle at the base: eyes at the

internal base of the tentacles: inner and posterior edge of the mantle digitated. Organ of the deferent canal immediately behind the left tentacle, corresponding organ posterior to it, upon the same side, and near the pulmonary orifice.

Shell sinistral, subglobular or lengthened, smooth, and polished; with a pointed exserted spire: aperture longitudinal, with the labrum sharp, and not reflected: labium extending upon the last whirl.

OBSERVATIONS.

The animal is distinguished from Limnea by the digitated mantle, and setaceous tentacles; and in having the foot slender, and generally keeled, instead of oval. This organ is better adapted for locomotion than in any of the allied genera; as the animal moves about with great ease and rapidity; with a uniform, gliding motion; and not by extending the foot forward, and drawing up the body.

The Physæ are generally less inclined to rest than the allied genera; they spend less time in a state of repose, and move about as usual, when Limnea and Planorbis are nearly torpid with cold. On the other hand, they do not

appear to suffer from a high temperature, as we find from the remarks of Mr. Lea.* When disturbed by each other, or by extraneous bodies, they whirl the shell about in such a manner as to convince the observer that it is a peculiar mode of defence.

This genus was first called Bulinus by Adanson, whose name has been retained under the form *Bulimus*, by Bruguière, and a few others; but Draparnaud's name prevails so universally at the present day, that nothing but confusion would result from a return to the first. Besides, the rule of priority, which must be so rigidly enforced with specific names, is adopted with greater latitude, when genera or families are concerned; because naturalists cannot allow the science to be tramelled here, by bad, inappropriate, or barbarous names; although it is proper, as far as practicable, to adopt those which were first proposed. A bad specific term affects but one species, whilst an improper generic or family name, may affect hundreds.

Adanson will have ample justice, if he be cited for Planorbis coretus, and Physa bulinus, simply because he rejected the Linnean nomenclature; preferring one which he constructed with the assistance of the niggers of Senegal. An author who is not struck with the absurdity of calling a genus of shells *apple snail*, objects to such names as *bobo*, used by Adanson; names, however, which are not worse than *physe des mousses!* or *horny coil shell!*

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* Tr. Am. Phil. Soc., vol. vi. p. 18.

PHYSA HETEROSTROPHA, *Say.*

PLATE 1.—PL. 2, FIGS. 1—9.

P. testâ ovatâ vel elongatâ, fuscâ vel castaneâ: anfractibus 4—5 convexis: suturâ conspicuâ.

SYNONYMS AND REFERENCES.

LISTER, Conch., pl. 135, fig. 34.
SCHRÖTER, Einl., vol. i. p. 201, Helix no. 84. Say.
LYMNEA HETEROSTROPHA, SAY. Nich. Encyc. (Am. ed. Art. Conch.) pl. i. fig. 6.—Physa heterostropha, Say, Jour. Acad. Nat. Sci., vol. ii. p. 177.
P. HETEROSTROPHA, GOULD. Invert. of Mass., fig. 141.
PHYSA HETEROSTROPHA, DESH. in Lam., vol. viii. p. 402.
BULLA FONTINALIS? *INDIÆ ORIENTALIS*, CHEMNITZ. Conch., vol. ix. pl. 103, fig. 879, 880.
BULLA CRASSULA? DILLWYN. Cat., p. 487, no. 36.
PHYSA AUREA, LEA. Tr. Am. Phil. Soc., vol. iv.

DESCRIPTION.

ANIMAL dark yellowish-grey, minutely dotted with whitish-yellow: foot, when extended, longer than the shell. When the shell is light colored, the animal is wine-yellow, dark yellowish-grey above, with a conspicuous spot upon each side of the forehead, made up of minute dots of

ochre-yellow, which cover the exposed parts. The mantle within the shell is dark brown, frequently spotted with light sienna, or golden-yellow, but in one variety it is black.*

Shell oval, ovate, or elongated, generally translucent, composed of four or five slightly convex whirls: suture well marked: apex pointed: aperture narrow, longer than the spire, with the labium expanded far upon the body whirl: columella thickened.

Color. Various shades, from light translucent yellowish-brown, to opaque chesnut; the outside and inside seldom presenting different shades.

Monstrosities. The end of the right tentacle furcated, and ending in two distinct points. —Dr. Reinhardt. The posterior extremity of the foot divided into two unequal parts; the one on the left being the smaller, and situated laterally.

Geographical Distribution. From latitude 31° to the St. Lawrence and the great lakes; and from the North-west Territory and "Canada,

* The shell of this variety cannot be distinguished from those containing light colored animals, either in shape or color.

to Saskatchewan." Mr. Nuttall brought specimens from Lewis' river, Oregon; Mr. Couper has found it on the Alatamaha, in southern Georgia; and Dr. Mighels in Maine.

OBSERVATIONS.

This species may be distinguished from Physa ancillaria by its greater length, darker color, and in never having a very wide aperture. I have examined hundreds from the Susquehanna, and have never found *one* which could be confounded with the ancillaria, as it occurs in the Delaware; although it is difficult to decide between those half-grown individuals in each, which have a wide aperture in heterostropha, and a narrow one in ancillaria; especially when those specimens of the former are chosen which have a rounded spire, as figure 8, plate 1.

An extensive suite of purposely selected specimens might show the propriety of uniting the two, but my present opinion is against such a step. Some elongated individuals may be confounded with P. gyrina, but these must be considered an accidental variety, as I never saw but two specimens, (figs. 6 and 7, plate 1,) which are very long, and these I collected from

a spring connected with the Susquehanna, which river P. gyrina does not inhabit. The posterior extremity of the labrum, is never suddenly incurved to meet the body whirl, as in P. gyrina.

I at one time believed (and described) the variety *fontana* as distinct, on comparing the soft parts with *heterostropha* proper, but I have since found the two gradually passing into each other. The growth of this variety is no doubt retarded by the coldness of the springs it inhabits; which causes the death, in a few days, of those brought from ponds or streams. I have noticed in a spring upon my premises, that the individuals which live upon the stones of a small ripple, are about twice the size of those upon the muddy bottom of the quiet water, two or three yards off. It must be this variety which is sometimes cited as 'P. fontinalis,' for the *shells* of the two species resemble each other very closely. The mantle, however, is not as large, nor the tentacles as thick as in P. fontinalis.

Explanation of Plate 1.

Figure 1 represents the digitated mantle of the right side; 2, the ova; and 3, a dorsal view of the animal.

PHYSA ANCILLARIA, *Say.*

PLATE 3.—FIGS. 1—10.

P. testâ subglobosâ, luteo-corneâ; anfractibus 4 convexis: suturâ inconspicuâ: spirâ brevi, acutâ, vel erosâ: aperturâ latâ.

SYNONYMS AND REFERENCES.

PHYSA ANCILLARIA, SAY. Journal of the Academy of Natural Sciences of Philadelphia, vol. v. p. 124.

P. ANCILLARIA, GOULD. Invert. of Mass., p. 213, fig. 142.

PHYSA SAYI, TAPPAN. Am. Jour. of Science, vol. xxxv. p. 269, pl. 3, fig. 3.

DESCRIPTION.

SHELL subglobose, with four convex narrow whirls, of which the last is much the largest; suture nearly obliterated; apex acute, but frequently truncate-eroded: aperture very wide, more than twice the length of the spire: labium thick.

COLOR yellowish or brownish corneous, columella generally white; submargins of the aperture frequently reddish.

MONSTROSITY. The last whirl with a square shoulder. Fig. 7.

OBSERVATIONS.

"The spire of this species is unusually short, truncated at tip like the Paludina decisa, and the suture is so inconspicuous as to give rise to the name which I have chosen for it. My brother, Mr. B. Say, obtained it in the Delaware river near Easton, and Mr. Jessup collected numerous specimens in the Connecticut river above Hartford. It may be distinguished from P. heterostropha, by the shorter and truncated spire, inconspicuous suture, as well as by the more obtusely rounded junction of the labrum with the base, and by the general form." —Say.

The very few specimens I have seen from the Connecticut river, (figs. 1 and 2,) have a more solid texture than those which inhabit the Delaware, (figs. 3—8,) but it is most probable that they constitute but one species.

I am indebted to Mr. Anthony for the specimen of "P. Sayi," (fig. 9,) and find it agrees in the very deep fold, and other characters, with a shell (fig. 10) from a branch of the Schuylkill, which I refer to P. ancillaria.

PHYSA OSCULANS, *Hald.*

PLATE 2.—FIGS. 11—13.

P. testâ ovatâ vel subglobosâ, griseo-fuscâ, tenui; anfractibus 5, suturâ impressâ: aperturâ latâ.

SYNONYMS AND REFERENCES.

BULLA FONTINALIS? Indiæ occidentalis, CHEMNITZ, vol. ix. pl. 103, figs. 879, 880.

PHYSA OSCULANS. This work, anno 1841.

DESCRIPTION.

SHELL allied to P. heterostropha, and presenting nearly the same varieties: translucent; texture very thin: lines of accretion fine: aperture wide, columella thick, with the fold obsolete, or but slightly impressed.

GEOGRAPHICAL DISTRIBUTION. Mexico? India?

OBSERVATIONS.

Specimens of this shell were presented to the Academy of Natural Sciences by Dr. M. Burrough; and Mexico is given as the native country; but as this enterprising traveller also made collections in India, it is not impossible that

they may be from the latter country. In either case, the species appears to occur in too great abundance to allow us to suppose that it is now characterized for the first time. Figure 13 is from a specimen in Dr. Jay's collection, and may be a distinct species.

PHYSA CONCOLOR, *Hald.*

PLATE 2.—FIG. 10.

Testâ ovatâ; spirâ productâ, apice acuto: anfractibus 4 convexis.

DESCRIPTION.

SHELL oval; spire produced, with the apex pointed: aperture oval, narrow, with the columellar fold distinct. Color honey-yellow.

OBSERVATIONS.

Characterized from a single specimen brought from Oregon by Mr. Nuttall.

PHYSA FRAGILIS, *Migh.*

PLATE 3.—FIGS. 11—13.

Testâ ovatâ, pallidâ, tenuissimâ, fragili: aperturâ latâ, repandâ.

SYNONYMS AND REFERENCES.

PHYSA FRAGILIS, MIGHELS. Boston Jour. of Nat. Hist., vol. iv. pl. iv. fig. 12.

DESCRIPTION.

ANIMAL "of a very obscure, light green color; whole surface of the body covered with oblong dark spots; foot shorter than the shell, lanceolate; tentacles nearly white, rather long, very slender; mantle blood-red."

SHELL obliquely ovate, translucent, extremely fragile and delicate: suture well marked: aperture very wide, labium not closely appressed, and without columellar fold.

GEOGRAPHICAL DISTRIBUTION. Inhabits Maine.

OBSERVATIONS.

Allied to P. ancillaria, but is distinguished by its greater tenuity, wider aperture, the tendency

of the labium to grow over extraneous matter, and the want of a fold in the columella. "Its motions are exceedingly rapid; very timid, withdrawing itself on the least alarm."

PHYSA GYRINA, *Say.*

PLATE 3.—FIGS. 1—6.

P. testâ elongatâ, castaneâ vel rubrâ: anfractibus 5—6 convexis: suturâ impressâ: apice acuto: aperturâ ovato-elongatâ; plicâ columellari obsoletâ.

SYNONYMS AND REFERENCES.

PHYSA GYRINA, SAY. Jour. Acad. Nat. Sci., v. ii. p. 171.
P. ELLIPTICA, LEA. Tr. Am. Phil. Soc. n. s., vol. v. p. 115, pl. xix. fig. 83.

DESCRIPTION.

SHELL oblong, polished, and translucent, with five or six convex whirls, and a well marked suture: spire gradually tapering to an acute apex: aperture more than one half the entire length, frequently thickened within the margin: columellar fold obsolete.

Color yellowish-brown to chesnut, rarely hyacinth-red.

Geographical Distribution. "Inhabits the waters of the Missouri . . . near Council Bluff." —Say. Mrs. Say has given me specimens from Indiana, and Mr. Anthony from Ohio. I have seen specimens from Georgia which appear to belong to this species; and Professor Adams notes it as occurring rarely in Vermont.

Foreign Analogue. Physa castanea.

PHYSA INTEGRA, *Hald.*

Plate 4.—Figs. 7, 8.

P. testâ ovatâ, pallidâ, subumbilicatâ: anfractibus 5 convexis, apice acuto: suturâ valdè impressâ: plicâ columellari obsoletâ.

SYNONYMS AND REFERENCES.

P. (*Diastropha*) *integra*, Hald. This work, March 13th, 1841.

DESCRIPTION.

Shell oval, with a lengthened, pointed spire:

whirls five, convex: suture deep: aperture obtuse posteriorly, peritreme continuous; labium not appressed anteriorly, and without a fold.

Color very pale yellowish-brown; labium, aperture, and varicose bands, white.

Geographical Distribution. Sent to me from Indiana by Mrs. Say.

PHYSA SCALARIS, *Jay.*

Plate 4.—Fig. 9.

Testâ ovatâ, anfractibus posticè angulatis: spira planodepressâ.

SYNONYMS AND REFERENCES.

Physa scalaris, Jay's Catalogue, 1839, pl. 1, figs. 8, 9.

DESCRIPTION.

Shell short, ovate, whirls with a distinct angulated shoulder: apex truncate-flattened: columellar fold obsolete.

Color . . . . bleached.

OBSERVATIONS.

Of this species, which occurs in Florida, I have seen but the single specimen in Dr. Jay's collection.

PHYSA DISTORTA, *Hald.*

PLATE 5.—FIGS. 1—3.

P. testâ lævi, diaphanâ, albidâ perforatâ contortâ et transversâ: anfractibus 3 convexis: suturâ valdè impressâ: aperturâ subrotundatâ.

SYNONYMS AND REFERENCES.

PHYSA (*DIASTROPHA*) *DISTORTA*, HALD. This work, October, 1840.

DESCRIPTION.

SHELL transverse, short, translucent and umbilicated; composed of three very convex whirls, and having a very deep suture: spire pointed, shorter than the aperture, which is oval, and almost cyclostomous, without any fold upon the labium or columella.

Color very light yellowish-grey.

Foreign Analogue. P. Guildingii, Sw.

Geographical Distribution. Near St. Louis, Mr. Emerson: Kentucky and Ohio.

OBSERVATIONS.

I am indebted to G. B. Emerson, Esq., President of the Boston Society of Natural History, for specimens of this curious shell, which were collected (by himself, I believe) near St. Louis. It is remarkable for the contorted spire, and entire absence of a columellar fold.

PHYSA HYPNORUM, *Lin.*

Plate 5.—Figs. 4—9.

Testâ elongatâ, tenui, politâ diaphanâ: anfractibus 5—6 planiusculis: spirâ subacutâ.

SYNONYMS AND REFERENCES.

Bulla hypnorum, Lin. Syst. Nat., p. 1185.
Physa hypnorum, Drap. Moll., pl. 3, figs. 12, 13.
" *hypnorum*, Lam. An. sans vert., v. viii. p. 400.
" " Cuv. Règne An., pl. 26, figs. 5, 6.
" *elongata*, Say. Jour. Acad., vol. ii. p. 171.

Aplexa hypnorum, Fleming. Moll. An., p. 158.
Aplexus hypnorum, Gray's Turton, p. 255, fig. 113.

DESCRIPTION.

Animal "deep black, immaculate above and beneath: tentacula setaceous, a white annulation at base."—Say.

Shell slender, translucent, and highly polished; composed of five or six obliquely revolving, flattened whirls: apex apparently acute, but when closely examined, will be found to be convex: aperture narrow, obtusely rounded anteriorly, acute posteriorly; labium scarcely apparent; columellar fold very slight.

Color ochre-yellow, or light yellowish-brown, sometimes presenting violet and green prismatic reflexions: columella sometimes rose-coloured.

Geographical Distribution. Inhabits Massachusetts, Vermont, New York, and the Western States, "stagnant ponds on the banks of the Mississippi."—Say. "Saskatchewan."—Dr. Richardson. Figures 7—9 were brought from Lewis' river, Oregon, by Mr. Nuttall.

OBSERVATIONS.

"When the shell includes the animal, it ap-

pears of a deep black color, with an obsolete testaceous spot near the base of the anterior [lower?] side. Its proportions are somewhat similar to P. hypnorum."

I follow Mr. James de Carle Sowerby in referring the elongata of Say to the hypnorum of Linnæus; but, if the large variety from Oregon should prove to be a distinct species, the name *clongata* may be applied to it.

PHYSA GLOBOSA, *Hald.*

PLATE 5.—FIGS. 10—12.

Testâ globosâ, tenui; spirâ abbreviatâ: aperturâ elongatâ, latissimâ.

SYNONYMS AND REFERENCES.

PHYSA (*PHYSELLA*) *GLOBOSA*, HALD. Jour. Acad. Nat. Sci., vol. viii. p. 200.

DESCRIPTION.

SHELL globose, translucent; spire very short and rounded; aperture very long and wide, oc-

cupying considerably more than half the entire area of the shell; fold well marked: whirls three.

FOREIGN ANALOGUE. Amphipeplea involuta.

OBSERVATIONS.

This small species inhabits the submerged rocks, in the rapids at the mouth of Nolachucky river, in Tennessee, under such circumstances as to convince me that it does not breathe the free air. I procured but two individuals, the shells of which are sufficiently translucent to exhibit light circular dots upon the black ground of the mantle; a common character in this genus.

PHYSA MICROSTOMA, *Hald.*

PLATE 4.—FIGS. 12—14.

P. testâ crassâ, lævi, pallidâ, ellipticâ; anfractibus 4 planiusculis: labio crasso; columellâ bidentatâ.

SYNONYMS AND REFERENCES.

PHYSA (*PHYSODON*) *MICROSTOMA.* This work, October 1840.

DESCRIPTION.

Shell elliptic, composed of four flattened whirls, separated by a distinct but very shallow suture: substance of the shell thick: spire shorter than the aperture, and ending in a point: aperture narrow elliptic, with a continuous peritreme, and the labium much thickened anteriorly: columella with two nacreous elevations, or obtuse teeth.

Color light brownish-ochraceous: columella and external periodical (varicose) bands, white, whilst the corresponding internal bands are chesnut.

Geographical Distribution. Kentucky and Ohio.

OBSERVATIONS.

This is a remarkable shell, and readily distinguished from all the American species of Physa, hitherto described, by the teeth upon the columella.

Genus LIMNEA, *Lamarck.*

Plate 1.—Fig. 1.

"Testa oblonga, interdùm turrita; spira exserta. Apertura integra, longitudinalis. Labrum acutum, infernè ad sinistrum revertens et ascendens, in columellam versus aperturam decurrit, plicamque obliquam mentitur. Operculum nullum."—*Lamarck.*

SYNONYMS AND REFERENCES.

Helix, Linnæus. *Buccinum*, Müller.
Bulimus, Bruguières.
Lymnæa, Lamarck. An. sans vert., vol. viii. p. 405.
Lymnæus, *Limnæus*, Drap., Turton, Say, &c.
Limnea, Fleming, G. B. Sowerby, Jr., etc.
Stagnicola, Leach. Mollusc., p. 141—145. (Gray.)
Cuvier. Mem. pour servir. à l'Hist. et à l'Anat. des Mollusques.—Le Règne Animal, Mollusques, p. 71.
Sowerby. Genera of Shells.
Penny Cyclopædia, vol. xiii. p. 500.

DESCRIPTION.

Animal spiral; elongated or subglobular: head depressed on each side; bearing two flattened, triangular, elongated tentacles; with the eyes at their anterior internal base: mouth

surmounted by a free, thin, and movable appendage: mantle simple: foot thin, oval, not extended anteriorly, and shorter than the shell: pulmonary orifice opening upon the right side, 'and near it the oviduct, whilst the organ of the deferent canal is situated near the right tentacle.' The sexes are united in the same individual.

Shell thin in texture, oval or elongated, surface smooth; spire exserted, tapering to a point more or less acute: aperture longer than wide, peristome incontinuous, the labrum turning and entering the aperture anteriorly, forming a single oblique fold upon the columella.

Example. Limnea catascopium.

OBSERVATIONS.

The shell can be most readily distinguished from Physa by being dextral; from Succinea by the fold upon the columella, which is wanting in the latter genus; and from Amphipeplea by the solider texture and more elongated form of the shell. The ova resemble those of Physa, except that the latter are deposited in a semicircular, and those of Limnea, in a linear mass. This distinction I have observed in several species, but it may not be universal.

The principal part of their food is contained in the slimy matter which covers sticks and stones beneath the water, and in the mud, which is constantly found in the intestines.

Doctor Gould informs me that towards the end of the warm season, he has seen the Limneæ eating each other's shells, and as Mr. Jeffreys has given the same account,* it is most probably correct; although Mr. Gray appears to doubt the fact, because the apex is sometimes deciduous, from a different cause.†

The genus Amphipeplea of Nilsson, unites Limnea and Physa by characters common to both, so that its situation is difficult to determine. It has the following characters in common with

Limnea.	Physa.
Shell dextral.	Shell short.
Tentacles triangular.	A lobed mantle.

If the foot is short and oval, I would place it under Limnea; if slender, and extended posteriorly, it belongs to Physa, where I place it

* Gray's ed. of Turton's Manual, p. 231. London, 1840.

† To avoid unnecessary repetition under each genus, an explanation of this circumstance, as well as of others appertaining equally to all the genera, will be found in the Introduction.

for the present. We know of no American species.

Dr. Sharpey suggests that the broad tentacles in the genus Limnea may be instrumental in *aquatic* respiration, as they are provided with cilia;* these, however, are not found upon the tentacles alone, as I have observed them upon the edges of the mantle and foot, and even upon the sole of the latter; moreover, they are not confined to the Limneans; the mantle and foot (but not the tentacles) of Melania, being similarly supplied. I had thought that the long and slender tentacles of Physa might be, in part, organs of scent;† and that the ciliary currents are necessary to make them acquainted with the locality of their food, the aroma of which could not well spread through the quiet waters they inhabit—but the genus Amnicola, which does not generally inhabit stagnant waters, has slender ciliated tentacles also.‡

* Cyclopædia of Anat., art. Cilia, vol. i. p. 621.

† Cuvier, Règne Animal Moll., p. 46.

‡ In discussing this question, it should be borne in mind, that the oxygenation of the system through the external surface, has been effected in frogs, which have been confined under water for the purpose of making the experiment. In this case, however, the water may find its way to the lungs.

The tongue of the Limneans is almost continually employed in the apparent office of taking food, as may be readily observed when the animal floats with the foot and mouth upwards. I have, on such occasions (in Physa heterostropha) observed bits of matter to be swallowed, and have found the water to be full of Volvox globator, and other Protozoa, which are probably brought within reach by the ciliary currents.

The following subgenera are indicated without any reference to the question of their correctness. The number happens to be five, as in Planorbis and Physa; but in the lower classes, they probably much exceed this number. The number five generally obtains, because, in genera, a greater number of distinct forms would tend to run the sections into each other; and not because Nature calls for a particular number. Still, as strong arguments have been brought forward in support of a quinary arrangement, I think it but fair that naturalists should give it an impartial and unprejudiced examination, in their peculiar departments.

Subgenera of Limnea.

Limnea, Lam. Shell lengthened, aperture slightly expanded.

L. appressa, pl. 5.

Radix, Montfort. Shell short, greatly expanded.

R. macrostoma, pl. 11.

? *Leptolimnea*, Sw. Nearly cylindrical; spire thick, lengthened; aperture small.

L. elongata, Sow. gen. fig. 6.

Bulimnea, Hal. Shell thick in texture, inflated, lip not expanded.

B. megasoma, pl. 3, fig. 1—3.

Acella, Hal. Shell slender, whirls very oblique, aperture expanded. Probably the same as Leptolimnea.

A. gracilis, Jay's catalogue, pl. 1, fig. 10.

LIMNEA CATASCOPIUM, *Say*.

Plate 1.

L. testâ conicâ, tenui, ochraceâ; anfractibus quinis convexis: suturâ excavatâ, spirâ acutâ: ultimo anfractu ventricoso, aperturâ ovatâ.

SYNONYMS AND REFERENCES.

L. catascopium, Say. Nich. Encyc. (Am. ed.) art. Conch., pl. ii. fig. 3.—Am. Conchology, pl. lv. fig. 2.

L. pinguis? Say. Jour. Acad. Nat. Sci., vol. ii. p. 123.

L. cornea, Val. Rec. d'Obs. de Zoologie, &c., par Humboldt et Bonpland, vol. ii. p. 251.

L. Virginiana? Lam., vol. viii. p. 411.—Desh. Encyc. méth. vers., vol. ii. p. 362, No. 21.

L. catascopium, Gould. Invert. of Mass., 223.

DESCRIPTION.

Animal light or dark yellowish-brown, minutely sprinkled with light yellowish: tentacles short, translucent, and light colored at their anterior base: foot about as long as the aperture, rounded posteriorly, with the base very minutely and thickly dotted.

Shell smooth and polished; composed of four or five convex whirls, in which the lines of growth are lightly marked; body whirl large and ventricose: suture well marked; spire shorter than the aperture; tapering to an acute point: aperture ovate: labium concave, with the fold well marked.

Variety, L. pinguis. "Shell oval, rather ventricose, pale dirty yellowish: whirls nearly four, rapidly diminishing to the apex, which is dull fulvous: suture moderate: spire rather more than half the length of the aperture: aperture large: labrum with the inner submargin a little thickened."—Say.

Color of the outside ochre yellow, but frequently covered with a coating of black foreign matter: inside sienna yellow.

Foreign analogue. Limnea peregra, Drap.

Geographical Distribution. Inhabits Massachusetts, Earle's catalogue: New York, near Niagara Falls, Dr. W. Blanding: the Hudson, Dr. Gould: the Northwest Territory, Mr. Taylor: from 'Canada to Saskatchewan:' and the Delaware.

Var. L. pinguis. The Northwest Territory, (fig. 9, Mr. R. C. Taylor,) and the Delaware (fig. 8—10,) and Schuylkill rivers. Mr. Nuttall has given me specimens from Lewis' river, Oregon; which, though considerably larger, appear to belong to this variety.

OBSERVATIONS.

I have thought it best to unite two of Say's proposed species, for the separation of which I think there are not sufficient grounds. My suite of specimens is not sufficiently extensive to demonstrate the identity of the two; but I think the original shells of my figures 6 and 10—12, have too near a resemblance to allow them to be separated as distinct species.

The variety differs in having a shorter spire, and the turns composing it more inflated; whilst the apex is not as much attenuated as in L. catascopium.

The animals of figs. 1 and 6 were taken from the Delaware at Camden, and are thickly covered with Cercaria bilineata, Hald.; a parasite which must be very annoying, when present in such numbers, as in this instance.

"It is with much hesitation that we adopt a new specific name for this shell (L. catascopium), having always heretofore considered it as the same with L. putris of Europe; as far as we can ascertain, the principal difference appears to be in the more oblique revolution of the whirls in the European species, and the more abrupt termination of the spire."—Say. The area of the aperture is not as great, nor is the labium as much expanded, as in the analogue.

Explanation of Plate 1.

Figure 1 represents the animal at the moment of opening the branchial cavity, to take in a supply of fresh air.

Figures 1 to 9 represent different forms of L. catascopium, as restricted by Say; the specimens being all from the Delaware, except those of 4 and 5; the latter is a profile outline of the left side, showing the depth of the umbilical emargination: 8, 9 show the form of the young: and 10, 11, 12 represent the variety L. pinguis.

The foreign analogue of this species is placed under the

subgenus Radix; on which account, a more characteristic species should have been given as the example (as L. jugularis;) but there might be some risk in citing an animal which I never saw, and which might possibly possess anomalous characters. Thus the editors of the current edition of the Règne Animal, instead of following their rule of figuring none but the best known species, have departed from it in preferring 'Cistuda clausa' (C. Carolina) a land animal, instead of figuring Terrapene Europæa, in illustration of the text: "On doit remarquer parmi les tortues *d'eau douce*, les tortues à boite." A little caution, in the study of the Mollusca, cannot be misplaced; when authors like Cuvier and Duvernoy have confounded the Testudininæ with the Emydæ, by placing too much confidence in the character of the shells.

LIMNEA EMARGINATA, *Say.*

PLATE 2.

L. testâ tenui, subdiaphanâ, anfractibus quaternis vel quinis convexis, ultimo maximo: suturâ valdè impressâ: apice acuto: crenâ columellari profundè emarginatâ.

SYNONYMS AND REFERENCES.

LIMNEUS EMARGINATUS, SAY. Journ. Acad. Nat. Sci., vol. ii. p. 270.—American Conchology, pl. 55, fig. 1.

DESCRIPTION.

Shell ovate-conic, thin in texture, translucent, and smooth; having the lines of growth very fine: there are five whirls, which are very convex, and are separated by a deep suture: apex, when present, acute: aperture wide, and more than half the entire length: labium turned over, so as to form an umbilic: fold on the columella obsolete: columellar depression deeply emarginate.

Color light ochraceous.

Geographical Distribution. Inhabits "lake Namakin, north of lake Superior"—Say: lakes in the North-west Territory,—Mr. Taylor: and the State of Maine,—Dr. Gould.

OBSERVATIONS.

"This species is rather larger, and considerably wider than L. catascopium; and the emargination visible on a profile view of the umbilical groove, is far more profound."—Say.

Specimens are not common in collections, so that it is difficult to define the limits of the species. Thus figure 1 differs considerably from figure 6, but they both agree in having a

deep emargination, as exhibited in figures 3 and 7—in wanting the fold upon the columella, and in having umbilics of the same character. Should the latter prove to be a distinct species, I propose to call it L. serrata; its distinguishing characters being the elevated lines, and the undulated peritreme. It is probably included by J. D. C. Sowerby among the new species discovered by Dr. Richardson.

Explanation of Plate 2.

Figures 4 and 5 are copied from an authentic specimen in the Academy's collection: 1, 2, 3, represent a more elongated variety, drawn from an imperfect specimen; and 6, 7, 8, a shell which is more ventricose, and is marked with a few transverse elevated lines upon the body whirl. These two shells, with many other species, were brought from the North-west Territory by Mr. R. C. Taylor, who gave them to Mr. Conrad; to whom I am indebted for the freshwater univalves contained among them.

LIMNEA MEGASOMA, *Say.*

PLATE 3.—FIG. 1—3.

L. testâ maximâ, inflatâ, rufâ; spirâ acutâ, non longitudo aperturæ habente: anfractibus quinis convexis: suturâ impressâ, aperturâ subovatâ; columellâ albâ, profundè plicatâ.

SYNONYMS AND REFERENCES.

LYMNEUS MEGASOMUS, SAY. Long's Expedition to the source of St. Peter's river, &c., vol. ii. p. 263, pl. xv. fig. 10.

DESCRIPTION.

ANIMAL blackish,—Binney.

SHELL very large, oval, inflated, and rather solid; composed of five convex whirls: the lines of growth are coarse, crossed by very fine, and almost obsolete, transverse lines: suture deep: spire short, and frequently much eroded, in large shells: aperture oblong ovate, capacious: fold on the columella well marked.

COLOR of the shell, yellowish-brown; within, reddish-brown.

GEOGRAPHICAL DISTRIBUTION. Found in the North-west Territory, Say: (north latitude

48°) and collected by Dr. Binney "in a swamp in front of the town of Burlington, Vermont, very near the shore of Lake Champlain."

OBSERVATIONS.

"This remarkably large and fine species was found in Bois blanc Lake, North-west Territory, by Dr. Bigsby, to whom I am indebted for specimens. The color is brownish, sometimes lineated across the body whorl with dull greenish and pale ochraceous; and the chesnut-brown color of the interior of the shell, combined with its large dimensions, distinguish this species from all others yet discovered in this country."—Say.

The shell of this species is rare in collections, and I am indebted to the liberality of Dr. A. Binney of Boston, for the only specimens in his cabinet. The shell reminds one of the young of Plekocheilus undulatus, Guilding.

The N. W. Territory must be the original station of this species; whence it has reached a distance of 1,500 miles, with the descending waters. The more rapid current of the Mississippi, and the difference in climate, have doubtless prevented it from establishing itself in the Western States.

LIMNEA RUGOSA, *Val.*

PLATE 3.—FIG. 4—5.

L. "testâ ovato-conicâ, tenui, albâ, tæniâ fulvâ obsoletâ ornatâ; anfractibus rugis plurimis exaratis."—*Valenc.*

SYNONYMS AND REFERENCES.

LYMNEA RUGOSA, VALENCIENNES. Receuil d'Obs. de Zoologie, etc., par Humboldt et Bonpland, vol. ii. p. 250, pl. lvi. fig. 5, a, b. An. 1833.

DESCRIPTION.

SHELL ovate-conic, thin, composed of six convex whirls, upon the later ones of which, the lines of accretion are very coarse: aperture elliptic, longer than the spire, columella reflected upon the last whirl, so as to form a small umbilic.

COLOR white, with a transverse spiral fulvous band.

GEOGRAPHICAL DISTRIBUTION. Mexico.

OBSERVATIONS.

This species was discovered by M. Bonpland in Mexico. My figures and description are taken from the work cited.

LIMNEA JUGULARIS, *Say.*

PLATE 4.

L. testâ magnâ, ovato-conicâ, lævi, tenui, pellucidâ: spirâ elongatâ, attenuatâ, apice subacuto: anfractibus longitudinaliter minutissimè striatis: ultimo anfractu ventricoso: columellâ profundè plicatâ.

SYNONYMS AND REFERENCES.

L. JUGULARIS, SAY. Nich. Encyc. Art. Conchology.
L. SPECIOSUS, ROSSMÄSLER, pl. 2, fig. 50.
L. STAGNALIS, Am. Jour. of Sci., vol. xxxi. p. 36. note †.

DESCRIPTION.

SHELL large, thin, ventricose, smooth, and diaphanous, composed of six slightly convex whirls, of which the lines of growth are very fine: spire contracted and subulate, with the apex pointed: aperture large, inner side subrectilinear, outer margin slightly expanded: columella with a deep fold: there is no umbilic, the labium being in close contact with the last whirl.

COLOR light ochre yellow.

Geographical Distribution. Lakes in New York, Michigan, North-west Territory, (fig. 2.) and Lewis's river, Oregon, (fig. 1.)

OBSERVATIONS.

The shell of this species bears a very close resemblance to that of L. stagnalis, but may be distinguished by the want of the prominent shoulder to the whirls, which is so conspicuous in that species. A single monstrous individual, presented to Academy's collection by Mr. Nuttall, has, however, a well developed shoulder. The surface of Stagnalis has a tendency to form facets, which is not the case with Jugularis; nor has it the spiral striæ quite as evident; a character still better developed in L. appressa. The revolution of the edge of the columella leaves a conical open axis, of about equal size in both species (but narrower in L. appressa) which admits of a view far into the shell. Both species agree remarkably well in the colour, texture, and translucency of the shells.

LIMNEA APPRESSA, *Say.*

PLATE 5.

L. testâ magnâ, elongatâ, pallidâ, tenui, lævi, transversim minutissimè striatâ, apice subacuto: anfractibus 6, subconvexis: aperturâ ovatâ.

SYNONYMS AND REFERENCES.

LYMNEUS APPRESSUS, SAY. Jour. Acad. Nat. Sci., vol. ii. p. 168.

L. SPECIOSUS, ZEIGL., ROSSMÆSSLER, Iconog., pl. 2, fig. 50.

DESCRIPTION.

"SHELL elongated ventricose: volutions 6: spire regularly attenuated to an acute tip, rather shorter than the aperture: body whirl dilated, proportionally large: aperture ample, columella with the sinus of the fold profound; callus perfectly appressed upon the shell, to the base."—Say.

COLOR, pale ochraceous, lighter than the preceding species, and frequently stained by a black foreign matter.

Geographical Distribution. From Lake Superior to New England, inclusive. The specimens figured were given to me by Dr. Binney, who procured them at Burlington, Vermont.

OBSERVATIONS.

I am not very confident that this is distinct from the preceding species; but admit it, because it is more attenuated, lighter in color, and has the spiral striæ better developed.

I cited Rossmässler's figure under the preceding species, on the strength of Gray's Turton; but I am now able (through the kindness of my friend Dr. Gould) to cite at once from the work itself; which convinces me that Rossmässler had this species in view, as his figure and minute description agree with it in every particular.

LIMNEA FRAGILIS, *Lin.*

PLATE 6.

L. testâ conicâ, acuminatâ, sub-perforatâ; irregulariter reticulatâ, et transversim minutissimè striatâ: anfractibus 6—7 convexis: suturâ impressâ.

SYNONYMS AND REFERENCES.

HELIX FRAGILIS, LIN. *BUCCINUM PALUSTRE*, MÜLLER.
LIMNEUS ELODES, SAY. Journal of the Academy of Natural Sciences, vol. ii. p. 169.—American Conchology, pl. 31, fig. 3, March 1832.
L. PALUSTRIS, J. D. C. SOWERBY'S Catalogue of Dr. Richardson's Shells, No. 32.
LIMNÆA ELODES, GOULD. Invertebrata of Massachusetts, p. 221, figs. 146, 147.
DESHAYE'S LAMARCK, vol. viii. p. 409.

DESCRIPTION.

ANIMAL fuliginous, minutely dotted with wax-yellow: central portion dark above; color nearly uniform below: foot elliptical, about two-thirds the length of the body whirl when extended: tongue spoon-shaped, mouth margined in front with a black horny plate or tooth.—Gould.

Shell oblong-conic, slightly umbilicated, composed of six convex whirls, the surface of which is frequently marked with irregular elevated reticulations, unconnected with the fine lines of growth, or the very minute spiral lines: suture very distinct, but not deep: aperture generally shorter than the spire, and sometimes having a calcareous rim within the peristome.

The characteristic shell has the irregular elevated lines, and convex whirls, as figure 1. The varieties are as follow:

A. Smooth, whirls convex, fig. 3.

B. Smooth, whirls flattened, figs. 4 and 11.

C. Color dark, aperture irregular, fig. 6.

D. Color light, aperture margined, fig. 7.

E. Aperture simple, color dark brown, fig. 9.

The varieties *D* and *E* have the minute spiral lines very distinctly marked, but the irregular reticulations are wanting: when these are present, the surface is divided into series of facets, which have been compared to those upon cut-glass.

Color various shades of brown and yellowish-brown, aperture frequently margined with chesnut.

Geographical Distribution. Found in the

North-west Territory; Canada, as far north as Great Bear Lake, and Maine: in Massachusetts, figs. 2, 6, 8, Dr. Gould: New York and Lake Erie, fig. 9: Ohio, figs. 1 and 7: Eastern Pennsylvania, figs. 3, 4, 10, 11, from a spring in Berks county, connected with the Schuylkill. I have a specimen $1\frac{1}{4}$ inches long, and rather more than half an inch in diameter, from Lewis' river, Oregon, which I refer to this species, although it is more ventricose than the individuals we are accustomed to see.

OBSERVATIONS.

I am indebted to Dr. Gould (who has given an interesting account of this species), for the description and drawings of the animal. Figure 5 will give those who are not acquainted with the animals of this family, an idea of the form of the head and tentacles.

Say remarks that his *elodes* "bears the most striking resemblance to L. palustris of Europe, and I am almost inclined to think it a mere variety of that species." I unite the two, because I am unable to point out any distinguishing characters between them. Whether the foreign shells are as variable among themselves

as ours are, I cannot tell; but I have specimens which, if found here, would be named *elodes* without hesitation. The respective soft parts *may* differ; but until such a difference be pointed out, I cannot but consider the two identical; nor can I admit doubtful species, or those nearly allied to others, upon a mere (so called) *specific character*, unless a *comparative character* be given at the same time. Surely it is not unreasonable to demand that enough be given to convey an idea of proposed species, which, in many cases, are difficult to identify, even from figures.

Mr. Gray is of opinion that the calcareous rim within the peristome of certain Limneæ and Planorbes, is formed when the waters they inhabit are nearly dried up; or in winter, when they are affected by cold—preparatory to the secretion of a diaphragm for their protection at these times.* However this may be, I have never observed the rim in any other of our species, and only in variety D. of this, whose appearance will always distinguish it, even when this character is wanting. This variety has not been hitherto observed east of the Allegany Mountains.

* Turton's Manual, p. 231 and 267. London, 1840.

LIMNEA UMBROSA, *Say.*

PLATE 7.

L. testâ elongatâ, ventricosâ, fuscâ: spirâ attenuatâ, acutâ: anfractibus senis, convexiusculis, transversim minutissimè striatis: aperturâ semicirculari; labro repando.

SYNONYMS AND REFERENCES.

LIMNEUS ELONGATUS, SAY. Journ. Acad. Nat. Sci., vol. ii. p. 167.

LIMNEUS UMBROSUS, SAY. Amer. Conchology, pl. 31. fig. 1.

DESCRIPTION.

Shell lengthened, ventricose, composed of six slightly convex whirls, of which the anterior one is somewhat inflated: surface covered with numerous minute transverse spiral lines: suture oblique, with little depth, but well marked: spire attenuated, with the apex acute: fold on the columella not well marked: aperture wide, nearly straight on the inside, wide anteriorly; less than half the length of the shell: body whirl above, longer than half the entire length.

Color various shades of brown, or reddish-brown; sometimes with light longitudinal lines, as in figue 6: the submargin of the peristome is frequently chesnut.

Geographical Distribution. "It inhabits, in considerable numbers, the ponds and tranquil waters of the Missouri, in the vicinity of Council Bluff; and Dr. Bigsby obtained specimens in Rainy lake and Seine river of Upper Canada." Found in New York, Ohio, Indiana, and Illinois.

OBSERVATIONS.

This shell is more ventricose than in any of the allied species, and the fold upon the columella is liable to considerable variation, being well marked in some individuals, and nearly obsolete in others. In some shells the apex is much elevated (the shell being in the normal position) because the plane of the aperture forms a large angle with the axis. Figures 2 and 7 represent this character largely developed.

The name first given to this species by Say was preoccupied, which led him to redescribe it under the one by which it has since been known.

LIMNEA REFLEXA, *Say.*

PLATE 8.

L. testâ elongatâ, tenui, fuscâ; longitudinaliter striatâ: apice acuto: anfractibus 7 convexiusculis: suturâ impressâ, obliquissimâ: aperturâ elongatâ: laminâ columellari crassâ et laxâ.

SYNONYMS AND REFERENCES.

LIMNEUS REFLEXUS, SAY. Jour. Acad. Nat. Sci., vol. ii. p. 167.—American Conchology, pl. 31, fig. 2.

LIMNÆA PALUSTRIS, var. distortus, ROSSMÄSSLER. Icon., vol. i. p. 97.

LYMNÆA EXILIS, LEA. Tr. Am. Phil. Soc. (new series), vol. v. p. 114, pl. xix. fig. 82.

DESCRIPTION.

SHELL very long and slender, composed of seven flattened, or slightly convex whirls, with exceedingly minute transverse revolving lines: lines of growth distinct, but sometimes very fine: suture well marked, revolving very obliquely: aperture oblong semicircular; columellar fold slight; labium not quite in contact with the body whirl at any part, particularly anteriorly, where there is a slight umbilical fissure.

Color fulvous, or brownish-ochraceous; the inner submargin being frequently highly colored with reddish-brown.

Geographical Distribution. Found in Superior and Erie Lakes, Say: in Ohio, Indiana, Illinois, and New York.

OBSERVATIONS.

This and the preceding species vary considerably among themselves; and occasionally approach each other in such a manner, that it is possible they may be but varieties, however characteristic specimens (as figure 1 of the respective plates) may differ. I believe them to be distinct; as, besides the general form, the columellar fold is better marked in L. umbrosa, and the labium is in contact with the preceding whirl. Mr. Lea gives the want of appression in the labium as the distinctive character of his L. exilis; but this character is present in all the specimens figured upon plate 8, except the young, figs. 7, 8. I am indebted to Messrs. Anthony, Conrad, and Olmstead, for placing the specimens figured, in my collection.

LIMNEA ATTENUATA, *Say.*

PLATE 9.—FIGS. 1—5.

L. test elongatâ, tenuissimâ, diaphanâ, fragili, acutâ: anfractibus 7 planulatis: suturâ impressâ, obliquâ: aperturâ semicirculari; plicâ columellari impressâ.

SYNONYMS AND REFERENCES.

LIMNEUS ATTENUATUS, SAY. Disseminator, p. 244, Aug. 12th, 1829.—Mrs. Say's reprint, p. 23.

DESCRIPTION.

SHELL very long and slender, with seven slightly convex whirls, revolving obliquely: suture rather deep: apex suddenly pointed: aperture small and semicircular, sometimes expanded: columellar plait well marked. The young shell does not differ materially from the adult.

COLOR wood-brown.

GEOGRAPHICAL DISTRIBUTION. Found by Say in the ditches and ponds about the city of Mexico.

OBSERVATIONS.

"This species is more nearly related to L. reflexus, Nob., than to any other known species of North America; but it is only necessary to compare the two, in order to perceive a wide difference between them. The present is smaller and proportionally more slender, and the spire is more attenuated."—Say.

LIMNEA EXPANSA, *Hald.*

PLATE 9.—FIGS. 6—8.

L. testâ inflato-conicâ, tenui, brevi, diaphanâ: aperturâ latâ, labro repando: plicâ columellari profundâ.

SYNONYMS AND REFERENCES.

L. EXPANSA, HALD. In this work, October, 1840.

DESCRIPTION.

SHELL short, smooth, translucent, and fragile; body whirl inflated: spire as long as the aperture, and rapidly attenuated to an acute apex:

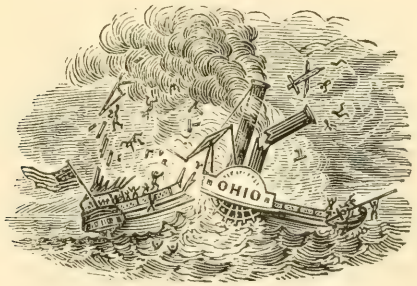
whirls five, somewhat flattened: suture shallow, but very distinct, aperture effuse: fold on the columella deep and distinct.

Color brownish ochre-yellow.

Geographical Distribution. Found only in Vermont.

OBSERVATIONS.

I owe the opportunity to describe this new species to Dr. Gould, who gave me specimens, and the information that they are from Vermont. It differs from L. elodes in having a polished surface, expanded aperture, obsolete lines of growth, translucency, and a deeper fold upon the columella. It cannot be confounded with any other species.



LIMNEA DESIDIOSA, *Say.*

PLATE 10.

L. testâ sub-inflatâ, perforatâ, tenui, luteâ: spirâ attenuatâ, apice acuto: anfractibus 5 convexis: suturâ valdè impressâ.

SYNONYMS AND REFERENCES.

LIMNEUS DESIDIOSUS, SAY. Jour. Acad. Nat. Sci., vol. ii. p. 169.—Am. Conch., pl. 55, fig. 3.

L. OBRUSSA ? SAY. Jour. Acad. Nat. Sci., vol. v. p. 123.

L. ACUTA, LEA. Trans. Am. Phil. Soc., (new series,) vol. v. pl. 19, fig. 81.

L. PHILADELPHICA, LEA. ib. Proceedings, vol. ii. p. 32.

DESCRIPTION.

ANIMAL with the foot as long as the two last whirls: tentacles short, broad, and translucent: color light yellowish-grey, dark upon the middle and light upon the edges: surface minutely dotted with whitish, which forms spots between the eyes.

SHELL somewhat inflated, thin in texture, and translucent: lines of accretion rather coarse: surface occasionally broken by a tendency to

form irregular facets: spire about as long as the aperture, and rapidly attenuated to an acute point: there are five convex whirls, separated by a deep suture: body whirl much the largest: aperture wide, generally obtuse posteriorly; peristome nearly level: labium thick and not appressed anteriorly: columellar fold slight, or wanting.

Color light ochraceous, sometimes brownish: polished within; and occasionally white nacreous, or pink, anteriorly.

Geographical Distribution. From latitude 35° to 45°, and from New England inclusive to the Mississippi; inhabiting rivulets and small lakes in great abundance.

OBSERVATIONS.

This species is subject to great variation in the form of the shell, but the animals of the slender and the ventricose varieties cannot be distinguished; and the shells approach each other by insensible gradations, as I have ascertained from the examination of several hundred specimens, many of them whilst living. Those represented by figures 1, 4, 5, 6, 7, 8, 9, are from a pond of spring water twenty feet in

diameter and two feet deep, on the Susquehanna, near my residence. It is subject to desiccation in very dry seasons, and has a bottom of mud, and but little vegetation, which is chiefly confervoid. The soil is slightly calcareous. I am thus particular, because this pond appears very favourably adapted to the growth of these animals, as well as Physa heterostropha and Planorbis bicarinatus. I have never found but the single specimens with as short a spire, or as wide an aperture, respectively, as those represented by 5 and 7.

Having received specimens of his 'L. acuta,' fig. 14, and 'Philadelphica,' fig. 10, from Mr. Lea, I have no hesitation in referring them to this species, to which his L. casta probably belongs also.

Explanation of Plate 10.

The shells figured are all Pennsylvanian. Figures 2 and 3 represent specimens from Tuscarora creek, and may be assumed as good examples of the species; 10 and 12 from near Philadelphia; 11, 13, 15, from near my residence; and 12, from the gutters along the road above Columbia. The last bears a very close resemblance to Say's *obrussa*, but I cannot, with certainty, refer the latter to the species under consideration, because I have not a sufficient number of authentic specimens for comparison.

LIMNEA CAPERATA, *Say.*

PLATE 11.—FIGS. 1—9.

L. testâ conicâ, anfractibus 5—6 convexis, transversim minutissimè striatis: apice acuto: suturâ valdè impressâ: aperturâ ovatâ.

SYNONYMS AND REFERENCES.

LYMNEUS CAPERATUS, SAY. Disseminator, p. 230, July 29th, 1829.—Mrs. Say's reprint, p. 23.

L. UMBILICATA, ADAMS. Boston Journ. Nat. Hist., vol. iii. p. 325, pl. iii., fig. 14.

L. UMBILICATA, GOULD. Invert. of Mass., p. 218, fig. 149.

DESCRIPTION.

ANIMAL dark colored, approaching to black, very minutely and sparsely dotted with whitish, which is scarcely perceptible, except between the eyes: tentacles long and very flat: foot as long as the aperture and adjoining whirl, rounded posteriorly: in the young, light spots are sometimes visible through the shell.

SHELL conic, composed of five or six convex turns, separated by a deep suture: apex pointed, and entire: lines of growth fine, but appa-

rent: surface closely covered with numerous and very fine spiral, light-colored, elevated, epidermal lines; which are quite distinct upon the young or half-grown, but obsolete upon the adult shell: aperture ovate, semicircular, or subrotund: labium apparent, with scarcely any fold; and separated from the basal whirl anteriorly, so as to form a more or less distinct umbilic.

Color yellowish-brown, sometimes marked with whitish or reddish varicose bands: aperture frequently stained with reddish-brown.

Geographical Distribution. Prof. Adams has sent me specimens from Vermont, and 'L. umbilicata' from New Bedford: Mrs. Say from the Wabash: Dr. Wm. Blanding from Illinois: Mr. Anthony from Ohio: and I have found it in eastern Pennsylvania.

OBSERVATIONS.

Two of the characters given by Say to this shell—"spire half the length of the mouth . . . . suture not very deeply impressed"—do not apply to any of seventy or eighty specimens now before me; all of which have a well marked suture, the spire equalling the length of the

aperture, but in most cases longer, and rarely shorter. There is, however, little doubt about these being the *caperata*, as they agree with most of the characters given, and especially with the description of the revolving lines. These are so superficial, as to be readily removed with a brush.

Explanation of Plate 11.

Figures 1, 2, 4, 6, 7, 8, are from specimens collected from a spring of shallow running water, subject to being dried up, and flowing into the Susquehanna at Marietta, Pennsylvania. The bottom is a deep bed of black tenacious mud, covered with grass.

Mr. Adams' specimens are from a somewhat similar locality. Figure 3 is from an Illinois specimen; 5 from a Vermont shell; whilst 9 represents 'L. umbilicata.'

LIMNEA SOLIDA, *Lea.*

Plate 11.—Figs. 10—13.

L. testâ conicâ, lævi, subsolidâ, umbilicatâ; apice acuto: anfractibus 4—5 convexis, suturâ excavatâ: aperturâ subovatâ, decoloratâ.

SYNONYMS AND REFERENCES.

L. SOLIDA, LEA. } Tr. Am. Phil. Soc., vol. vi. p. 94 and
L. APICINA, " } 102, pl. 23, fig. 91.

DESCRIPTION.

SHELL obtusely conical, smooth, and umbilicated; with four or five convex whirls, separated by a deep suture: apex pointed: aperture polished, subovate, with the fold conspicuous when young, and obsolete in the adult.

COLOR pale bluish-grey, apex and aperture various shades of reddish-brown: young ochraceous.

GEOGRAPHICAL DISTRIBUTION. Found by Mr. Nuttall near the mouth of Wallamut river, Oregon.

OBSERVATIONS.

As Mr. Lea's figures 91 and 94, (the latter purporting to be 'L. apicina,') are too distinct to represent the same shell, it becomes necessary to give my reasons for not admitting the latter as a species. These are, the fact that my figures represent but one species: the information from Mr. Lea that the shells figs. 11

and 12 are 'L. apicina,' the perfect agreement of the former shell (fig. 11) with the description and remarks, and the tolerable resemblance to the figure of L. solida, and of the shell fig. 12, with the description of 'L. apicina;' lastly, an examination of his specimen of L. solida (fig. 13) afforded me by Mr. Lea.

LIMNEA COLUMELLA, *Say.*

PLATE 12.

L. testâ ovatâ, fragili, diaphanâ: anfractibus 4 convexis, ultimo maximo; lineis transversis minutis corrugatis: aperturâ latâ.

SYNONYMS AND REFERENCES.

L. COLUMELLA, SAY. Nich. Encyc. (3d Amer. edit.) Lymnea, No. 3.—Jour. Acad. Nat. Sci., vol. i. p. 15.

L. COLUMELLA, GOULD. Invert. of Mass., p. 215, fig. 144.

VAR. *CHALYBEA*, " Ibid. p. 216, fig. 145.

L. NAVICULA, VAL., in Rec. d'Obs. de Zool. etc. par Humb. et Bonpl., vol. ii. p. 251.

L. ACUMINATA, ADAMS. Am. Journ. Sci., vol. 39, p. 374.

L. MACROSTOMUS, SAY. Journ. Acad. Nat. Sci., vol. ii. p. 170.

L. MACROSTOMA, GOULD. Invert. of Mass., p. 217, fig. 148.

L. COARCTATA, LEA. Proceed. of Am. Phil. Soc., vol. 2, p. 33.

DESCRIPTION.

SHELL ventricose, ovate, fragile, thin in texture, and diaphanous: suture impressed and conspicuous: whirls 4, with the lines of accretion apparent, and crossed by minute spiral striæ: spire narrow, acute, and much shorter than the aperture: aperture very large, more or less expanded; labium a thin film of enamel, not quite appressed anteriorly; peritreme extremely thin and fragile, entering the axis, and forming an open spiral, of which two or three turns are generally visible.

COLOR light straw yellow, frequently tinged greenish, brown, or black, by foreign matter.

GEOGRAPHICAL DISTRIBUTION. Maine, Massachusetts, Pennsylvania, Ohio, South Carolina, the North-west Territory, and Lake Winnipeg.

FOREIGN ANALOGUE. L. ovata.

OBSERVATIONS.

The labium is sometimes scarcely visible,

and in this case, the shells are difficult to distinguish from those of some species of Succinea. They differ very much among themselves; and, in some instances, approach L. auricularia in form. 'L. macrostoma' appears to me to be nothing more than a variety with a well expanded aperture; a distorted individual, in fact, (fig. 6) having been a 'columella' until it suddenly assumed the macrostomous form in the body whirl. 'L. succiniformis,' Adams, MS., I refer to this species. Say alludes to a variety which he found in Missouri, and which, judging from its color, must be identical with the variety 'chalybea.' To be obtained in perfection, this species must be sought for early in the spring.

Reference to Plate 12.

Figures 13—15 represent the original 'L. columella;' 1—5 'L. macrostoma;' 9 'L. chalybea;' and 8, 10—12 a shining delicate variety, which may be considered a distinct species by some.

LIMNEA HUMILIS, *Say.*

PLATE 13.—FIGS. 1—8.

L. testâ parvâ, ovato-conicâ, tenui, umbilicatâ: anfractibus 4—5 convexis: suturâ impressâ.

SYNONYMS AND REFERENCES.

LYMNEUS HUMILIS, SAY. Journ. Acad. Nat. Sci., vol. ii. p. 379.

LYMNEUS MODICELLUS, SAY. Journ. Acad. Nat. Sci., vol. v. p. 122.

LYMNEA MODICELLUS, GOULD. Invert. of Mass., p. 218, fig. 149.

L. PARVA? LEA. Proceed. Am. Phil. Soc., vol. ii. p. 33.

DESCRIPTION.

ANIMAL as far as exposed, translucent; except the central portion, which is very light brown: tentacles short, triangular, with a black point upon the anterior basal edge.

"SHELL (L. humilis) ovate conic, thin, translucent, with slight wrinkles; volutions nearly six, convex, terminal one very minute; suture well indented; aperture about equal in length to the spire; labium with an obvious plate of

calcareous deposit; a distinct, and rather open umbilical aperture; color pale reddish-white. Total length seven-twentieths. Inhabits South Carolina.

"Of a dozen specimens sent me by Mr. Elliott, none exceeded the limit here assigned to the species. It differs from any other species I have seen; a variety of it, sometimes quite black, was found by Dr. M'Euen at Owego, on the Susquehanna."—Say.

"Shell (L. modicellus) blackish, not elongated, whirls rather more than four, convex; suture deeply impressed; apex acute; aperture very regular, the labium and labrum being subequally curved; the fold of the columella rather slight. Total length $\frac{7}{20}$ of an inch; breadth $\frac{1}{3}$; length of the aperture $\frac{1}{2}$.

"Smaller than any of the species I have hitherto described. It was found by Dr. M'Euen, at Owego, on the Susquehanna river, near the State of New York."—Say. "The animal of *modicellus* is bottle-green, without exception."—Gould.

Color light yellowish, and translucent, when not obscured by foreign matter.

Geographical Distribution. From Maine to South Carolina inclusive: Ohio.

OBSERVATIONS.

Found upon damp ground near water, or upon muddy flats left by the receding water. It is difficult to retain them in confinement, on account of their dislike to living in the water; and they accordingly pass over the edge of the vessel in which they may be placed, and move off to the distance of several feet, upon a dry surface. When too much of their moisture becomes abstracted, they contract, and remain in an apparently torpid state, until they are moistened. They are infested by a species of Cercaria, a genus which appears to have been first detected upon our Limneans by myself. The short thick shells constitute the *humilis* of Say, and are common on the Susquehanna. (Figs. 2, 3.) These do not quite correspond with the Carolina specimens, (fig. 1.) I have received the slender variety *modicella*, from Maine, through Dr. Mighels; from Massachusetts, through Dr. Gould; and from Ohio, through Mr. Anthony.

The shells are delicate and fragile, and differ considerably among themselves; but I cannot regard them in any other light than as well marked varieties.

I inadvertently neglected to have the Carolina shell (constituting the original *humilis*) figured in full; which I regret, because the Susquehanna specimens, though similar in form, differ somewhat in texture, approaching L. desidiosa in this character. This leads me to doubt whether they may not eventually merge into the last named species, as a short, ventricose variety.

LIMNEA BULIMOIDES, *Lea.*

PLATE 13.—FIGS. 9, 10.

L. testâ curtâ, inflatâ, perforatâ, pallidâ, subdiaphanâ: anfractibus 4 convexis: suturâ impressâ.

SYNONYMS AND REFERENCES.

L. BULIMOIDES, LEA. Proceedings Am. Phil. Soc., vol. ii. p. 33.

DESCRIPTION.

SHELL short and inflated, composed of about 4 convex whorls; surface smooth and shining; lines of growth inconspicuous and undeviating,

not crossed by spiral striæ: aperture as long as the spire, level, sub-round, and slightly produced posteriorly: labium very closely appressed, except anteriorly, where it forms a small umbilic; columella without fold: spire generally much eroded, with the apex frequently truncated.

Color pale ochraceous, sometimes marked with reddish varicose bands.

Geographical Distribution. Brought from Oregon by Mr. Nuttall.

OBSERVATIONS.

Small specimens resemble L. humilis; but the texture is more dense, the appearance more robust, the surface smoother, and the color more decidedly ochraceous.

LIMNEA PALLIDA, *Adams.*

Plate 13.—Figs. 11—13.

L. testâ conicâ, fragili, simplice, pallidâ: anfractibus 5—6 convexis: plicâ columellari conspicuâ.

SYNONYMS AND REFERENCES.

L. PALLIDA, ADAMS. Bost. Journ. Nat. Hist., vol. iii. p. 324, pl. 3, fig. 13.—Am. Journ. Sci., vol. 39, p. 374.

DESCRIPTION.

SHELL conical, smooth, imperforate, thin in texture, and fragile; with 5 or 6 slightly convex whirls, and a shallow well-defined suture: spire as long the aperture, or longer, with a subacute apex: aperture ovate, symmetrical; columellar fold well marked, and remarkably constant: lines of accretion very fine, and undeviating; crossed by minute spiral corrugations.

COLOR varying from pale ochraceous to white; apex often tinged with brown.

GEOGRAPHICAL DISTRIBUTION. "Habitat at Shoreham, Vermont, on shores of Lake Champlain, clinging to rocks and stones."—Adams.

OBSERVATIONS.

The shell of this species presents no varieties. It is easily recognised by its regularly conical and beautiful form, pale uniform tint, and columellar fold. Its affinities are L. desidiosa and L. humilis.

LIMNEA VITREA, *Hald.*

PLATE 13.—FIGS. 14, 15.

L. testâ ovatâ, perforatâ, latâ, tenuissimâ, diaphanâ: anfractibus 4 convexis.

SYNONYMS AND REFERENCES.

L. VITREA, HALD. This work, October 5th, 1841.

DESCRIPTION.

SHELL ovate, extremely thin and delicate: surface smooth and polished: lines of growth very fine: aperture ample: the labium presents a well marked fold, and is not appressed anteriorly: spire short.

GEOGRAPHICAL DISTRIBUTION. Ohio? Missouri?

FOREIGN ANALOGUE. L. tenuis, Bronn.

OBSERVATIONS.

This species presents us with a shell which is probably thinner in texture than that of any other which we have. For the specimens figured, I am indebted to Mr. G. B. Emerson, President of the Boston Society of Natural History.

LIMNEA DESIDIOSA?

PLATE 13.—FIGS. 16—18.

SYNONYMS AND REFERENCES.

L. OBRUSSA, SAY. Journ. Acad. Nat. Sci., vol. v. p. 123.

DESCRIPTION.

"SHELL oblong, rather slender, pale yellowish testaceous: whorls five, slightly rounded: apex acute: suture deeply impressed: aperture not dilated, within pure white: columella with the sinus of the fold very obvious.

"LISTER, pl. 114, fig. 8?"

OBSERVATIONS.

Found by Say in a small rivulet above Philadelphia. His specimens in the Academy's collection, agree very nearly with some collected by myself from ditches along the Susquehanna, and which I consider as a marked variety of L. desidiosa. They are generally smaller and narrower than this species; and the posterior extremity of the aperture has a stronger ten-

dency to become obtuse, as in figure 16; nevertheless, the evidence is not sufficient to induce me to believe the two to be distinct; and I consequently leave the question open to future observation.

LIMNEA FERRUGINEA, *Hald.*

PLATE 13.—FIGS. 19, 20.

L. testâ parvâ, ovatâ, imperforatâ: anfractibus 4 convexis: suturâ impressâ: aperturâ ovatâ: plicâ columellari conspicua.

SYNONYMS AND REFERENCES.

L. FERRUGINEA, HALD. This work, March 13th, 1840.

DESCRIPTION.

SHELL ovate-conic, thin in texture and diaphanous, with 4 convex whirls, distinct suture, and well marked columellar fold: aperture oval, about as long as the spire: labium appressed: ferruginous.

GEOGRAPHICAL DISTRIBUTION. Hab. Oregon, Mr. Nuttall.

OBSERVATIONS.

Closely allied to L. humilis, but may be distinguished by the want of an umbilic, and the well defined fold on the columella.

LIMNEA GRACILIS, *Jay.*

PLATE 13.—FIG. 21.

L. testâ pergracili pallidâ, prælongâ; spirâ productâ: anfractibus 4—6 planulatis.

SYNONYMS AND REFERENCES.

L. GRACILIS, JAY's Catalogue, pl. 1, fig. 10.

DESCRIPTION.

SHELL very slender, with from 4 to 6 flat, and very obliquely revolving whirls: suture distinct, lines of accretion fine; labium unattached, without fold: aperture ovate, spread out, and rounded at both ends.

COLOR nearly white.

OBSERVATIONS.

This is the most slender species of Limnea known to exist in collections, and was discovered by Professor Emmons in Lake Champlain. Professor Adams mentions a specimen in his cabinet "one inch in length, and in the convexity of the penult whorl only .15 in. diameter. The last whorl is scarcely broader, except across the lips, both of which are expanded. Although nearly seven times longer than the average breadth, it has only 4½ whorls."—Am. Journ. Sci., vol. 40, p. 268.

LIMNEA GALBANA, *Say.*

PLATE 13.—FIGS. 22, 23.

L. testâ parvâ, curtâ perforatâ, lævi: anfractibus 4 convexis: suturâ profundâ.

SYNONYMS AND REFERENCES.

L. GALBANUS, SAY. Journ. Acad. Nat. Sci., vol. v. p. 123.

DESCRIPTION.

"SHELL subovate, whorls nearly five, very

convex: suture very deeply impressed: apex acute: body whorl a little flattened in the middle: aperture not dilated, columella with the sinus of the fold very obvious."—Say.

Color . . . . bleached and chalky.

OBSERVATIONS.

This species is allied to L. humilis, but is much thicker in texture, and has a better developed shoulder to the whirls. All the specimens known, occur in a superficial deposit on the margins of a pond or small lake in western New Jersey, and I believe the species to be extinct, with, perhaps, one or two others from the same locality, which will bring this deposit within the Tertiary period of geologists.

LIMNEA CATASCOPIUM?

Plate 14.

OBSERVATIONS.

Since the article on this species was published, Dr. Mighels of Portland, Maine, has sent

me specimens of a species of Limnea, for which he proposed the name *decollata*, and which he has since published in conjunction with Professor Adams, in the Boston Journal of Natural History. Figures 1, 2, 3, represent this proposed species; and 4 (distorted) 5, specimens from Oregon, referred to on page 8, as belonging to L. catascopium. The great resemblance existing between 1 and 5, is sufficient to induce me to consider them as being the same; and they do not appear to have any character to warrant a separation from L. catascopium, or a union with L. emarginata, or any other allied species.

LIMNEA FRAGILIS, *Lin.*

PLATE 15.—FIG. 1.

OBSERVATIONS.

My friend Dr. Gould objects to my having referred L. elodes, Say, to the Helix fragilis, Lin. In this, I merely followed Lamarck, and others, whom we may presume to be good

authority in European conchology. Yet, what species the Helix fragilis of Linnæus really is, seems undecided, as will appear from the following extract from Dr. Gould's letter:—"I have fallen in with Cantraine's Malacologie méditerranée et littorale, in Mém. de l'Acad. des Sciences et Belles lettres de Bruxelles, tom. xiii., from which I extract under *L. palustris*—'Cette espèce que j'ai recueillie dans la Salone etc. me parait appartenir aux deux continents, car je ne pense pas que le Lymnea elodes, Say, en differe,' p. 158. Under L. stagnalis—'Comme le dernier tour dans les adultes est hors de proportion avec ceux qui précèdent, le jeune âge doit avoir une autre physiognomie. La coquille est alors moins ventrue et plus en fuseau. Dans cet état c'est *H. fragilis*, Lin., No. 704, Gmel. p. 3658. L. speciosus, Ziegl. Rossm. i. p. 50. Sturm viii. pl. 12.' J'y consens!! I think Linnæus would never have applied such a name to our *elodes* alias *palustris*, when he well knew others so much more fragile."

Having already adopted the earlier name *fragilis*, and not having sufficient grounds to induce me to abandon it, I reproduce it here, although I would not have used it in the first

instance had I known that doubts exist as to the shell intended. The figure is from an Oregon specimen alluded to on page 22. A similar one has been recently named L. Nuttalli by Mr. Lea.

Figure 2 of Plate 15 is a faithful representation of an European shell which has recently made its appearance in our collections, under the name of L. palustris, which I figure for comparison. It differs so much from the normal appearance of this shell, that it is possibly a distinct species, and identical with our L. umbrosa.

This monograph of the genus Limnea includes all Say's species, together with those of other authors with which I am acquainted. There are, however, some names and descriptions of presumed new species, which I cannot identify, and which it will be necessary for their proposers to make known by figures and comparative characters; as, to prevent this work from being interminable, it is not now my intention to recur to genera, which, like the present one, are as nearly finished as my facilities permit.

Genus PALUDINA, *Lamarck.*

Plate 1.—Fig. 1.

Testa conoidea: apertura integra, ovata: anfractibus convexis: marginibus connexis, acutis: operculum corneum.

SYNONYMS AND REFERENCES.

Helix, Linnæus, Gmelin, Dillwin.
Turbo. Buccinum. Vivipara. Cyclostoma.
Nerita, Müller, Schröter.
Bulimus, (Bulinus,) Poiret.
Paludina, Lamarck. An. sans Vert., vol. viii. p. 509.
„ Sowerby. Genera of Shells.
Cuvier. An. du Mus., vol. xi. p. 170—Memoires pour servir à L'Histoire et à L'Anatomie des Mollusques. Anno 1817.

DESCRIPTION.

Animal with the head short and truncated, extending a little beyond the shell: rostrum very small: mouth terminal, furnished with two lateral jaws: tentacles slender and subulate, the eyes situated upon an enlargement of their

external base: the foot is a thin broad linguiform disk, longer than the shell, much extended anteriorly, and bearing an opercle upon its upper posterior surface: mantle simple.

Shell conoid, whirls convex, modifying the spiral cavity: aperture ovate or subrotund, widest anteriorly, the margins united, sharp, and never reflected: aperture closed with a thin corneous opercle, of which the lines of increase are generally concentric.

Example. Paludina decisa.*

OBSERVATIONS.

"The name of the genus was adopted by Lamarck, from Bruguière, but Montfort applied to it the name of Viviparus, which is retained by Blainville in his plate, though in the text he adopts that of Paludina."—Say. As Lamarck was the first to perceive and define the natural limits of the genus, as characterized by him, he must be cited as authority for it.

* This species is chosen as an example of the genus, because the accompanying description of the animal has been drawn principally from it. This mode will be pursued with the subsequent genera, when reference to the entire animals of typical species cannot be made.

The animals of this genus are of sluggish habits; they feed upon living or decayed vegetable matter, and respire water, in which they live entirely, generally preferring a bottom of soft mud, upon which they are well adapted for progression, on account of the great extent and flexibility of the foot. Its extension in front prevents them from taking food, except when at rest. They prefer nearly stagnant waters, or rivers with sluggish currents. The Paludinæ are viviparous, depositing the young in the spring, which have lain in the ovaries during the winter. The sexes are said to be distinct. The genus is here restricted by the omission of the small oviparous species,* with subspiral opercles, and the foot short anteriorly.

The shells of some species make so near an approach to those of certain Ampullariæ, that it is difficult to distinguish them. In this case, an aperture narrowed posteriorly, and a lengthened spire, will generally indicate the genus Paludina sufficiently for ordinary purposes.

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* As P. lustrica, Say, which is the type of a new genus, (Amnicola, Gould and Hal.) suggested by Dr. Gould.

PALUDINA DECISA, *Say.*

PLATE 1.

P. testâ ventricoso-conicâ, tenui, pallidè virente, lævigatâ: spirâ elongatâ, apice obtusâ: anfractibus valdè convexis: aperturâ subovatâ, posticè angulatâ: suturâ valdè impressâ.

SYNONYMS AND REFERENCES.

LISTER, Conch., pl. cxxvii. fig. 27. Cochlea virginiana è flavo viridescens, non fasciata.

PETIVER, Gazophyl., pl. cvi. fig. 18.

P. DECISA, SAY. Nich. Encyc., (Amer. ed.,) art. Conch., pl. ii. fig. 6. Anno 1818.—Am. Conch., pl. x. fig. 1.

CHEMNITZ, vol. ix., pl. cxxxii. fig. 1184.?

VALENCIENNES. Receuil d'Obs. de Zool., par Humb. et Bonpl., vol. ii. p. 253. P. limosa, Say. *P. CORNEA*, ? VAL. op. cit.

DESHAYES in Lam., vol. viii. p. 516, an P. ponderosa junior ?

P. HETEROSTROPHA, KIRTLAND. Ohio Geol. Rep., p. 200.

DESCRIPTION.

ANIMAL light cream-yellow, or bluish, marked with numerous orange spots upon the head, tentacles, and foot; the under surface of the

last more finely dotted: tentacles dark above; eyes black and conspicuous: foot translucent, very large anteriorly, ending square, but slightly emarginate in the centre: rostrum small, and scarcely projected beyond the edge of the shell. The centre of the under surface of the foot is marked with light reticulated lines, which are radiated towards the edges.

Shell thin, subconic, and polished, with six convex whirls: spire lengthened, having the apex rounded: aperture wide and pyriform; labrum meeting the body whirl at an angle: suture deep: lines of growth very fine: spiral striæ minute or obsolete.

Color of the shell bright green, or yellowish-green; inside bluish-white.

Geographical Distribution. The streams of New Jersey, the Delaware, Schuylkill, and rarely, the Susquehanna. Common throughout New England, Dr. A. A. Gould. Ohio, J. G. Anthony. "The species is very common in various parts of the Union,"—Say. Dr. Wm. Blanding has given me specimens which he collected from the Mississippi in Iowa Territory, and from Fox river, between Galena and Chicago. It occurs in the Nolachucky and

Tennessee rivers, on the south shore of Lake Michigan, and Mr. R. C. Taylor brought specimens from the "Four Lakes" of the North-west Territory.

OBSERVATIONS.

The quite young have a very low spire, a globular form, and the aperture very wide, nearly equalling half the entire lower surface in area. The soft parts are semitransparent, without any orange spots. The young are excluded in March, when the shells are 0.14 or 0.15 of an inch in length, composed of rather less than three entire whirls. In autumn, previous to the sinking of the animals into the mud to hybernate, the ovaries of the female (extending within the apex of the shell) will be found to contain many young, apparently in as perfect a state as when excluded in the spring.

Dr. Gould (MS.) states that the shell is bristled with filaments, which are visible when in the water; particularly upon half grown individuals.

Deshayes does not admit this species in his edition of Lamarck, but places the name (with a question) among the synonyms of P. ponde-

rosa. It must be confessed that the two are nearly allied, but I think it would be immature to unite them until a complete series of the shells of both could be shown, which would indicate the passage of the adult of one into that of the other species. P. decisa has a thinner shell and narrower aperture; nor are the lines of growth so suddenly recurvent as in P. ponderosa. The young have a near resemblance, but the larger the decisa grows the less is the resemblance apparent.

Valenciennes cites Say's description of P. limosa (Journal of the Academy, vol. i. p. 125) for this species; and, leaving size out of the question, descriptions of the two shells would very nearly correspond. M. Valenciennes' specimens are about an inch in length, the true limosa being no longer than 0.15 of an inch.

This species has been found heterostrophe in Ohio, the Delaware, and in Vermont; and upon this variety Professor Kirtland has founded his species.

Reference to Plate 1.

Fig. 1 represents an animal from the Susquehanna, where the shells are shorter than usual. Fig. 2 is taken

from a Schuylkill shell, of which *a* represents the opercle. Fig. 3 is from a Massachusetts specimen. Fig. 4 is from a reversed Ohio specimen in the cabinet of Mr. Lea. Figs. 5 and 6 represent the young of different ages.

PALUDINA SUBCARINATA, *Say.*

PLATE 2.

P. testâ elongatâ, tenui, apicè acutissimâ, (interdum erosâ,) pallidè fusco-virente: anfractibus quinis vel senis, valdè convexis, transversim striatâ: suturâ valdè impressâ: aperturâ ovatâ, posticè rotundatâ.

SYNONYMS AND REFERENCES.

P. SUBCARINATA, SAY. Nich. Encyc., (Amer. ed.) art. Conch., pl. i. fig. 7.

P. CARINATA, VALEN. Rec. d'Obs. de Zool., par Humb. et Bonpl.

DESCRIPTION.

ANIMAL with the foot translucent, the sides parallel, the front truncated, and the posterior extremity obtusely rounded. The general colour is dark grey, dotted with light orange.

SHELL conoid, elongated, thin and translu-

cent, with from four to six ventricose volutions, which are covered with numerous fine transverse elevated striæ: apex pointed: suture deeply impressed and canaliculate: aperture regularly ovate, rounded posteriorly: peristome entire. The later additions of the opercle are concentric, whilst the centre is subspiral.

Color of the outside very light brownish-green; inside bluish-white.

Geographical Distribution. Found in the Delaware, Schuylkill, and Susquehanna rivers: near Cincinnati, Ohio, J. G. Anthony.

OBSERVATIONS.

This species is closely allied to the preceding, both in external form and general habits, so that the natural history of one is that of the other. The shell may be distinguished from that of P. decisa by the subrotund aperture, pointed apex, elevated striæ, and dull exterior. Those inhabiting running waters have the shell thick and opaque, with the apex eroded. The orange spots upon the animal are lighter and smaller than in the preceding species.

The young, when first excluded throughout the spring and summer, are spirally striated,

and have less than three complete whirls. The shell is more lengthened and much less ventricose than the young of P. decisa.

REFERENCE TO PLATE 2.

Figs. 1 and 2 represent a very large individual, of which 1*a* is the opercle. Figs. 3 and 4 are views of a more characteristic specimen. Fig. 5 is the very young.

PALUDINA INTEGRA, *Say.*

PLATE 3.

P. testâ elongatâ, fuscâ vel olivaceâ: anfractibus quinis vel senis, convexis: suturâ valdè impressâ: aperturâ integrâ, posticè obtusâ vel rotundatâ.

SYNONYMS AND REFERENCES.

P. INTEGRA, SAY. Jour. Acad. Nat. Sci., vol. ii. p. 174.

DESCRIPTION.

"SHELL olivaceous, pale, conic: whirls six, wrinkled across: spire rather elongated, entire at the apex: suture profoundly indented: aperture sub-ovate, less than half the length of the shell."—Say.

"Inhabits the waters of the Missouri.

"Length 1-4 of an inch. [1.4 in.? or 1¼ in.?]

"Very much resembles P. decisa; the spire, however, is more elongated, and never truncated at the apex, but always acute."—Say.

Geographical Distribution. Inhabits the Santee canal, South Carolina, (fig. 3,) T. A. Conrad: Ohio, (figs. 1, 2,) J. G. Anthony: the Mississippi, in Iowa Territory, (fig. 4,) Dr. W. Blanding.

OBSERVATIONS.

I have made use of Say's description and remarks, as this is a species ? about which there is some uncertainty. The shells here figured are generally received as P. integra, although every one must have remarked the discrepancy between their size and that given above. Mr. Say's time, however, was too valuable to be spent in searching for large specimens; we accordingly find that he described his Paludina subcarinata from a specimen having three whirls; and figured Melania virginica from one with but five; whilst good specimens of both shells have just twice the number of whirls given. It is possible that the size, as given in

the original description, is a typographical error.

This may be a variety of P. decisa; but as the characters appear to be constant, it may stand as a species until a more extended examination of specimens can be made. Deshayes has truly remarked, that specific distinctions exist, not so much in the distinctness, as in the permanency of the characters; and that it is sometimes necessary to make extensive comparisons before just decisions can be made.*

Reference to Plate 3.

Figs. 2 and 3 represent a very large individual; 1 is the usual size and appearance; 4, a strongly marked variety; 5, the young; and *a*, an opercle.

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* His words are—"il faut, pour éviter une autre source d'erreurs, avoir à sa disposition une collection très considérable par le nombre des espèces et celui des individus appartenant à chacune d'elles, la valeur d'un caractère spécifique résidant plutôt dans sa constance, malgré sa faiblesse, que dans sa grandeur, et cette constance ne peut être constatée que par l'examen d'un grand nombre d'individus provenant de localités diverses."—Lam. An. sans Vert., tom. vii. p. 329. Anno 1836.

PALUDINA PONDEROSA, *Say.*

PLATE 4.

P. testâ ponderosâ, subconicâ, lævigatâ; striis transversis minutissimè corrugatis: apice obtusâ: anfractibus convexis: suturâ valdè impressâ: lineis longitudinalibus recurvatis: aperturâ ovato-oblongâ.

SYNONYMS AND REFERENCES.

P. PONDEROSA, SAY. Jour. Acad. Nat. Sc., vol. ii. p. 173.
„ „ Amer. Conchology, pl. 30, fig. 1.
SOWERBY'S Genera of Shells, fig. 2.
DESHAYES' LAMARCK, vol. viii. p. 516.

DESCRIPTION.

SHELL ponderous, subconic, and polished, having from six to seven complete whirls: spire lengthened: suture deeply impressed, and canaliculate: aperture oblong ovate, narrowed and rounded posteriorly: labium thickened, and conspicuous: lines of growth undeviating until near their anterior extremity, where they are recurvent; labrum much advanced at this part: surface with very fine transverse wavy striæ,

and occasionally banded with colors a little lighter or darker than that of the general surface: opercle thin, oblong ovate, with the lines of growth concentric.

Color of the shell light green (when young) to dark olivaceous externally, and bluish-white within.

Variety *A*. The shell does not exceed an inch in length; the transverse wavy striæ are obsolete; the spire is low, and truncate-eroded, and the labium very much thickened posteriorly. Specimens were given to me by Mr. Conrad, who found them in the Alabama river.

Geographical Distribution. This, the largest of our species, inhabits the Wabash, Ohio, and other western rivers. "Paludina ponderosa seems a common inhabitant of all the rivers of the west, from the northern districts of Indiana and Illinois, to the waters of the Tennessee valley."—Conrad, New Fresh Water Shells, p. 12.

OBSERVATIONS.

Deshayes thinks this species might as well be placed in the genus Ampullaria, whilst Say believed it to be allied to Melania. "On pour-

rait aussi bien placer cette coquille parmi les Ampullaires que parmi les Paludines, son ouverture se trouvant plus allongée et plus étroite que dans la plupart des espèces de ce dernier genre."—Deshayes. I regret that I am unable to give a figure, or at least a description of the animal, of this fine species.

REFERENCE TO PLATE 4.

The inferior surface of two shells, an opercle, and the very young are represented. The specimens figured are not of the largest size.

PALUDINA GENICULA, *Conrad.*

PLATE 5.

P. testâ subovalis, spirâ elongatâ: anfractibus quaternis scalariformis, posticè angulatis.

SYNONYMS AND REFERENCES.

P. GENICULA, CON. N. F. w. Shells, p. 48, pl. 8, fig. 3.

DESCRIPTION.

SHELL suboval, composed of four scalariform whirls, which are angulated posteriorly: spire

elevated, diminishing rapidly: apex obtuse: lines of growth fine and distinctly marked: surface polished: aperture more than half the length of the shell. The opercle has the lines of accretion concentric.

Color of the shell greenish; aperture bluish.

OBSERVATIONS.

A single shell of this species was found by Mr. Conrad in Flint river, Georgia. This unique specimen is now in the cabinet of Mr. Poulson.

Reference to Plate 5.

Figures 1 and 2 are views of the upper and lower surfaces of the shell, of which *a* represents the opercle. The latter, it will be observed, had been broken, and was subsequently repaired by the animal.

PALUDINA VIVIPARA, *Lin.*

PLATE 6.

P. testâ ventricosâ, subperforatâ, tenui, subdiaphanâ, fusco-virente: anfractibus quinis, convexis: spirâ elongatâ, apice obtuso: fasciis transversis fusco-rubris: suturâ valdè impressâ: aperturâ rotundatâ, intus transversim fasciatâ.

SYNONYMS AND REFERENCES.

LISTER, Conch., pl. cxxvi. fig. 26.
HELIX VIVIPARA, LINNÆUS, GMELIN, p. 3646, No. 105.
NERITA VIVIPARA, MÜLLER. Vermes, p. 182, No. 370.
CHEMNITZ, vol. ix., pl. cxxxii. fig. 1180, 1181.
PALUDINA VIVIPARA, LAMARCK. An. sans Vert., vol. viii. p. 511.
SAY, Nich. Encyc. (Amer. ed.) art. Conch., pl. ii. fig. 5.
" American Conchology, pl. x. the two side figures.
P. LINEATA, VALENCIENNES. Rec. d'Obs. de Zool., etc., par Humboldt et Bonpland, vol. ii. p. 255.

DESCRIPTION.

SHELL subconic, ventricose, thin, and slightly translucent; with five inflated volutions: there are several reddish bands visible within and

without: spire lengthened, apex scarcely rounded, suture deeply impressed: aperture subrotund.

Color of the outside greenish, or brown; of the inside, whitish.

Geographical Distribution. Say's specimens were obtained from the St. John's river in Florida; Mrs. Say has sent me specimens from the Wabash, and Mr. Conrad from near Tuscambia, Alabama; Mr. Anthony has been informed of its existence near St. Louis, Missouri, and in Michigan: Valenciennes' specimens are from Lake Erie: Cuba is given as the locality of a specimen in the cabinet of the Academy of Natural Sciences.

OBSERVATIONS.

This is one of the very few species common to Europe and North America. A comparison of the soft parts may be necessary to prove those found on different sides of the Atlantic to be identical; but where there is not a sufficient difference in the shells to establish varieties, it is not probable that the soft parts would present distinctive specific characters.

Deshayes does not cite Say's figures among

the great number of synonyms which he has added to those of Lamarck; thinking perhaps that this might be a distinct species. He had access to the American Conchology, as he admits several species from it, and cites a figure from the same plate upon which P. vivipara stands.

Being the first Paludina known to naturalists; the fact that it is viviparous attracted early attention, and became the foundation of its specific name. I believe every species of true Paludina will be found to be viviparous (or ovo-viviparous) and know of eight distinct species which are.

Explanation of Plate 6.

Fig. 1*a* represents the opercle belonging to 1 and 2, (from the Wabash); fig. 6 is the natural size of a young shell taken from the former, which had been dried with the animal enclosed; fig. 5 is a thin light coloured half-grown shell from Alabama; and figs. 3 and 4 a variety with a lengthened spire, copied from Say's figure, the original specimen being probably from Florida. The shells from the Wabash have a smaller and more circular aperture than those from the South; and the half-grown have a greater resemblance to the adult in form and color.

I have cited Linnæus as authority for the preceding species, because he was the first to describe it under the

adopted specific name. The author who institutes and names a species, should always be cited as the earliest authority for it, under whatever genus or other division it may be placed by later systematists. Species are permanent, but other divisions must be modified from time to time, as opportunities to gain the requisite information occur; and it appears to be a gross act of injustice to the earlier zoologists, to leave them nothing for their labors, because they could not take advantage of information acquired after their time. One author thinks he does ample justice to his predecessor, by citing him among the synonyms; but here he should place his own name, if he thinks it sufficiently important to occupy a place, merely because he has the very trifling merit of placing a well known animal or plant in its appropriate modern genus. In some works, but few synonyms are cited, and in such, the founder of a species might be omitted entirely. It is true, that Linnæus never described a shell under the name of Paludina; but he specified one as vivipara; and no one would suppose that he formed the genus, should his name be placed after the species, so that there would not be a cause of error. On the contrary, when we find a modern author citing himself incidentally, (for a European bird, for instance,) we might be led to wonder, why a species had remained so long uncharacterized. Thus, besides depriving us of the power to know whether a species has been long known, or recently described; there is a source of error laid open, which could scarcely exist, if the juster course were pursued. This is subject to no abuses, whilst the self-appropriating system affords every facility for acts of injustice. Unnecessary divisions are made, apparently

with no other object; and the pretender, who wishes to be cited as the authority for placing certain species in certain genera, has only to prowl over the works of naturalists of high standing, until he finds something which will answer his purpose. Thus he may discover that Paludina dissimilis is an Anculosa—pretend that the genus Exogyra is untenable, (which will enable him to place Ostrea or Chama before, and his own name after, all the species)—or that of the synonyms Lytta and Cantharis, (the former being preferred by the Germans, the latter by English entomologists,) Say chose the worst for his L. Nuttalli, which can accordingly be changed to Cantharis Nuttalli; or, all the species of Cantharis may be changed back to Lytta, without the trouble of going to "the base of the Rocky Mountains" for species.

The various changes in nomenclature can be placed with propriety only in the list of synonyms, and it is giving what is not wanted, to place the name of him who has done the least for a species, after it; instead of his, to whom we owe it; especially when it is mentioned incidentally, without immediate reference to the original synonym. It is better to have a single original authority for a species, cited throughout all works, than to have a different one for every author who chooses to publish upon it. An intermediate plan might be adopted, which would place "of authors," (Auc.) after species like the above; or to cite the original authority with the later one, thus: Paludina vivipara, Lin., Lam. I might cite authorities for my own views, but they are divided; the majority perhaps, holding opposite opinions; (as many of them are more or less interested

in the appropriating system;) but injustice should not be sanctioned on *any* authority.

Could the good old Swede have foreseen the havoc destined to be made among his species, he would certainly have placed the founders of the modern credit system among his Damnati. Thus in the dismemberment of the Simiadæ, not a single genus was left under his appropriate name, Simia; and all the species were transferred, as a matter of course.*

The original spirit of all this is a desire to be credited with *something*, however trifling; and as original research is difficult, some method had to be devised to abstract from the well filled stores of the older authors; and in such a manner as not to excite suspicion; just as influential criminals who undergo a regular trial, are sometimes set free by a preconcerted "flaw in the indictment." The proceedings, in both cases, have an appearance of justice, but nothing more. The original author loses his species, whilst the act of his successor is about as creditable as the productions of those painters who, according to Reynolds, "if they have a history or a family piece to paint, the first thing they do is to look over their common-place book, containing sketches which they have stolen from various pictures; then they search their prints over and pilfer one

* It is conceded by all, that the Nerita urcea of Müller, (subsequently named Ampullaria rugosa by Lamarck,) should be called Ampullaria urcea; and as Lamarck cites Müller's name as a synonym, no one can claim the discovery of the identity of the two: we accordingly find that no author has ventured to give himself as authority for the species.

figure from one print, and another from a second," which (he might have added) enables them to get their names into the catalogues, whilst not a thought is bestowed on those to whom the originals owe their existence.

PALUDINA GEORGIANA, *Lea.*

PLATE 7.—FIGS. 1, 2.

P. testâ elongatâ, ventricosâ, anfractibus quaternis vel quinis, convexis: suturâ impressâ: aperturâ rotundatâ, posticè angulatâ.

SYNONYMS AND REFERENCES.

P. GEORGIANA, LEA. Transactions of the Am. Phil. Soc., new series, vol. v. p. 116, pl. xix. fig. 85.

DESCRIPTION.

SHELL elongated, ventricose, thin and smooth; with four or five convex volutions: suture deep, and well marked: aperture nearly round, angulated posteriorly.

COLOR of the outside green, inside whitish.

GEOGRAPHICAL DISTRIBUTION. Found as yet only at Hopeton, near Darien, Georgia.—Lea.

OBSERVATIONS.

This species is most nearly allied to P. decisa, Say; from which it may be distinguished by the subrotund aperture; and from P. vivipara, by the want of the rufous bands. That it is a distinct species, I have not the least doubt. I am indebted to Mr. Lea for the use of his original specimen to figure and describe.

PALUDINA BENGALENSIS, *Lam.*

PLATE 7.—FIGS. 3, 4.

P. testâ conicâ, tenui, acutâ, pallidè virente, transversim fusco-lineatâ: apertura subrotundatâ.

SYNONYMS AND REFERENCES.

P. BENGALENSIS, LAM. An. sans vert., vol. viii. p. 513.

P. FASCIATA, BOWD. Elem. of Conch., pl. ix. fig. 15.*

DESHAYES Encyc. Meth. vers, vol. iii. p. 691, No. 3.*

" Voy. aux Ind. par Bel. Zool., p. 419, No. 9, pl. i. figs. 14, 15.*

P. ELONGATA, SWAINSON. Zool. illustr., first series, pl. xcviii. Anno 1821—2. Not the P. elongata of Sowerby.

P. MULTILINEATA, SAY. Disseminator, Aug. 12th, 1829. p. 245. Mrs. Say's reprint, p. 21.

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* Cited by Deshayes.

DESCRIPTION.

Shell lengthened, conic, and polished; composed of six or seven convex whirls, the surface of which is covered with minute transverse wrinkles, and numerous narrow spiral bands: apex pointed; suture deep; lines of accretion very fine; aperture regularly rounded, produced posteriorly.

Color light green, often passing into brownish; the spiral bands are fuscous, and the inside white.

OBSERVATIONS.

"Captain Leconte presented me with a shell which, he informed me, he found in the river St. John, Florida. I described it nearly four years since under the name of multilineata; but recently, being about to publish it, on a more attentive examination and comparison with a specimen of the elongata from Calcutta, I have concluded that it varies from that specimen only in having the umbilicus a little smaller." —Say.

The shell figured is in the collection of the Academy of Natural Sciences, where it was

placed by Mrs. Say. There appears to be no reason to doubt the locality of this specimen; at any rate, Say was satisfied upon this point, and I accordingly admit it as indigenous, upon his authority. I have compared the original specimen with shells from Calcutta, and find that it differs as little from them, as they do from each other. It is smaller than the foreign specimens, but I think a larger native shell was mislaid, or placed accidentally among the foreign ones, in the same collection; so that, rather than commit an error, I have chosen the reputed American example for my illustration. If this is not the Bengalensis of Lamarck, it must have the name given to it by Say; that of Swainson having been previously given to a fossil species.

PALUDINA CARINATA, *Val.*

PLATE 8.

P. "testâ conoideâ, tenui, subdiaphanâ, viridi; anfractibus quinis, longitudinaliter striatis, et transversim carinatis."—*Val.*

SYNONYMS AND REFERENCES.

Paludina carinata, Valenciennes, in Rec. d'Obs. de Zoologie, &c., par Humboldt et Bonpland, vol. ii. p. 252, pl. lvi. fig. 2, *a*, *b*.

DESCRIPTION.

Shell conoid subdiaphanous and slightly umbilicated; having five convex turns which are longitudinally striated, and transversely carinated, with four elevated lines, of which the first and third are larger than the second and fourth: aperture angulated posteriorly, nearly circular, but having the longitudinal greater than the transverse diameter; the peristome is slightly thickened, and the edge is not sharp.

Color green; with a tinge of brown upon the last whirl; aperture white.

Geographical Distribution. Mexico.

OBSERVATIONS.

This species was discovered by Humboldt in Mexico, and is admitted on the authority of Valenciennes, who wrote the conchological part of the work cited; and from which I have taken the above descriptions, and my plate of the shell.

PALUDINA SUBPURPUREA, *Say.*

PLATE 9.

P. testâ conicâ, subpurpureâ: spirâ elongatâ, apice subconvexo: anfractibus quinis, convexis: suturâ impressâ: aperturâ ovato-rotundatâ.

SYNONYMS AND REFERENCES.

P. SUBPURPUREA, SAY. Disseminator, vol. ii. p. 245. Mrs. Say's reprint, p. 21. Am. Conch., pl. xxx. fig. 2.

DESCRIPTION.

ANIMAL "very pale bluish, with minute yellow points, particularly on the rostrum, tentacula, and prominent respiratory tube, which is as long as the tentacula: eyes on the exterior side of the tentacula,* near the middle of their length: the anterior portion of the foot is very short."—Say.

SHELL ovate-conic, composed of about five

* Say followed the foreign authorities in considering this to be the plural form; whereas it is the singular, the plural being tentaculæ.

convex whirls, of which the lines of growth are very fine and oblique: spire lengthened, with the apex scarcely obtuse: suture well marked: aperture ovate-orbicular, widest in the middle; the posterior end of the labrum is much advanced upon the penultimate whirl: a few indistinct spiral bands are sometimes visible.

Color. The tint is difficult to define, but would be approached by a dark shade of Syme's 'brownish purple red' mixed with dark 'broccoli brown;' the inside being a lighter tint of the same color.

Geographical Distribution. Inhabits the Wabash, and some of its branches: Mr. Anthony has received information of its occurrence near St. Louis, and has sent me a specimen from Wisconsin.

OBSERVATIONS.

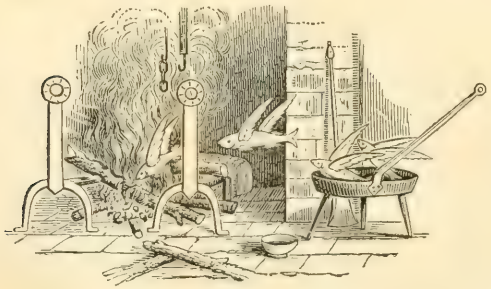
The tubular cylindrical organ supposed by Say to be a respiratory siphon, is probably the outlet of the viscous glands; but I am not now able to refer to Cuvier's memoir to ascertain the fact. In Paludina decisa it is strongly dotted with orange, and projects forward from the posterior angle of the aperture, at some

distance within the margin, being upon the right side. It will scarcely be confounded with another organ resembling the point of a tentacle, situated near the external base of the left tentacle.

The foot is described as short in front; but although this is the case (in the genus) when the animal is in a state of repose, it is far advanced when in motion; and it is a singular fact that the rostrum of the animal is not advanced at the same time, the latter indeed, being scarcely ever visible.

Explanation of Plate 9.

Figures 1 and 2 are taken from an adult specimen in the cabinet of the Academy of Natural Sciences; 3 and 4 represent half-grown shells.



PALUDINA INTERTEXTA, *Say.*

PLATE 10.—FIGS. 1—6.

P. testâ conicâ, tenui, ampullaceâ, diaphanâ: apice obtuso: striis transversis minutissimè corrugatis: anfractibus quaternis, vel quinis: suturâ valdè impressâ: aperturâ posticè rotundatâ, intus transversim fasciatâ.

SYNONYMS AND REFERENCES.

P. INTERTEXTA, SAY. Disseminator, vol. ii. p. 244. Mrs. Say's reprint, p. 20. Amer. Conchology, pl. 30, figs. 3, 4.
P. TRANSVERSA, SAY. Disseminator, vol. ii. p. 215. Mrs. Say's reprint, p. 20.

DESCRIPTION.

SHELL large, thin, ventricose, and slightly translucent; with about five volutions: suture deep: surface polished: lines of growth undeviating: spiral marks and lines numerous, and very finely wrinkled: aperture large, ovate, and rounded posteriorly: opercle translucent, with the lines of accretion concentric.

COLOR of the shell dark olivaceous, or brownish: aperture edged with black, columella white,

inside reddish, sometimes bluish, and generally banded with reddish: opercle bright claret color.

Geographical Distribution. Found abundantly in the neighborhood of New Orleans: South Carolina is given as the locality of specimens in the Academy's collection.

OBSERVATIONS.

The young shell is shorter, more transverse, the aperture proportionally wider, the peristome rarely edged with black; and the anterior portion of the labium is often of a bluish tinge.

Say's figure was taken from a shell about the size of my figure 3, which represents a shell differing considerably from the large one figured; the two agree, however, in the minutely corrugated surface, and the transverse interior bands.

The somewhat lengthened spire, and the want of an umbilic, distinguish this shell from Ampullaria, as characterized by Lamarck; although its approach to that genus is sufficiently near, to render an examination of the animal necessary, before its proper place can be permanently determined. "It is remarkable for the numerous obsolete transverse lines; which

P. HETEROSTROPHA.

1—9. *P. HETEROSTROPHA*, Say. 10. *P. CONCOLOR*, Hald. 11—13 *P. OSCULANS*, Hald.

Archives H. Lawson del. et col.

1–8 *P. ANCILLARIA*.—Say. 1 3 var 11, 13 *P. FRAGILIS*.—Müll.

Mint Bates & Lowe imp. del. et lith.

1—6 *P. GYRINA*.—Say. 7—8. *P. INTEGRA*.—Hald. 9 *P. SCALARIS*.—Jay

1–3 *P. DISTORTA*. 4–9 *P. HYPNORUM*. 10–12. *P. GLOBOSA*. [illegible] *MICROSTOMA*.—Hals

Miss Helen E Lawson del et col

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L. CATASCOPIUM, Say.

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L. EMARGINATA, Say.

1_3 *L. MEGASOMA*, Say

4_5 *L. RUGOSA*, Valen.

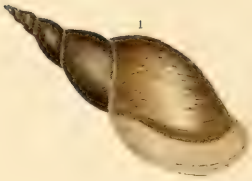
1

2

L. JUGULARIS, Say.

Miss Helen F. Lawson, del. et col.

Alex Lawson Sc.



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L. APPRESSA, Say.

L. FRAGILIS. Lin.

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L. UMBROSA. Say

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L. REFLEXA,—Say.

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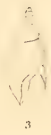

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1—5. *L. ATTENUATA,* Say.

6—8. *L. EXPANSA.*—Hald.

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L. DESIDIOSA,—Say.

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1. *L. CAPERATA*.—Say.

13. *L. SOLIDA*.—Lea

1—7. *L. MACROSTOMA*—Say.

8—15. *L. COLUMELLA*—Say.

Miss Helen P. Lawson del. et col.

Alex Lawson

1—8. *L. HUMILIS*.—Say. 9—10. *L. BULIMOIDES*.—Lea. 11—13. *L. PALLIDA*.—Adams.
14—15. *L. VITREA*.—Hald. 16—18. *L. OBRUSSA*.—Say. 19—20. *L. FERRUGINEA*.—Hald.
21. *L. GRACILIS*.—Jay. 22—23. *L. GALBANA*

L. DECOLLATA.—Mugh

1

2 a

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P. DECISA, Say.

1

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1*a*

4

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2

— *P. SUBCARINATA*, Say.

1

a

2

P. GENICULA, Conrad

Published by P. Lawson del. et lith.

Oscar A. Lawson Sc.

1

3

1a

4

2

1—2. *P. GEORGIANA*, Lea. — 3—4. *P. BENGALENSIS*, Lam

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P. CARINATA, Valen.

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P. SUBPURPUREA, Say.

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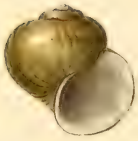

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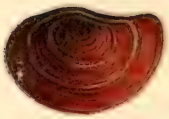

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1–6. *P. INTERTEXTA*, Say

7–8. *P. SUBGLOBOSA*, Say